

**HAZARD RANKING SYSTEM (HRS)
DOCUMENTATION RECORD - REVIEW COVER SHEET**

Name of Site: R&H Oil Company

Contact Persons

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Pathways, Components, or Threats Not Scored

- 1) Surface Water Pathway: The surface water pathway has not been scored because there is no overland flow segment or flood potential for this site. The nearest perennial surface waters are located approximately 3 miles southwest of the site and surface water is not used as a source of drinking water for the City of San Antonio. Based on available information, evaluation of the surface water pathway would not significantly affect the overall site score.
- 2) Soil Exposure: Soil exposure has not been scored because no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1,3). Further, there are no workers present on-site as the site is currently inactive (Ref. 6, pp. 7, 10). The site is enclosed by a chain-link fence in fair condition along all of its boundaries, with the exception of the northwest boundary (Ref. 7, p. 3). The nearest resident individual is located approximately 120 feet east of the site, across Somerset Road (Ref. 23, pp. 1, 3).

Even though apparent hydrocarbon seeps and areas of stained soils were observed in various areas of the site, scoring the ground water pathway alone is sufficient to score the site (Ref. 1, Sec. 2.2.3).

- 3) Air Pathway: The air migration pathway has not been scored because an observed release to the air migration pathway has not been documented and there are no analytical data to support a release. Based on the available information, evaluation of the air migration pathway would not significantly affect the overall site score (Ref. 1, Sec. 2.2.3).

HRS DOCUMENTATION RECORD

Name of Site: R&H Oil Company

Site Spill Identifier No.:

CERCLIS Site ID No.: TXD057577579

EPA Region: 6

Date Prepared: 20 November 2000; revised 29 January 2001

County and State: Bexar County, Texas

General Location within the State: The site is located within the city limits of the City of San Antonio, Bexar County, Texas approximately 6.5 miles southwest of downtown San Antonio.

Topographic Map(s): The following U.S. Geological Survey (USGS) 7.5-minute topographic series maps were used in locating the site: San Antonio East, Texas (1992); San Antonio West, Texas (1993); and Terrell Wells, Texas (1992) (Ref. 23, pp. 1-3).

Latitude: 29° 22' 19.93" North (Ref. 3, p. 2).

Longitude: 98° 32' 15.39" West (Ref. 3, p. 2).

The geographic coordinates were obtained at the north central portion of the site utilizing a hand-held Global Positioning System (GPS) based on the North American Datum-27. Accuracy is estimated at +50 meters (Ref. 3, p. 2).

Scores

Air Pathway	Not Scored
Ground Water Pathway	100
Soil Exposure Pathway	Not Scored
Surface Water Pathway	Not Scored

HRS SITE SCORE	50
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NOTES TO THE READER

1. The R&H Oil Company site is an abandoned oil refinery and gasoline blending facility located in the southern portion of San Antonio, Bexar County, Texas. Specifically, the refinery was a crude oil refinery and a used oil facility that operated under many different oil/processing companies (Ref. 3, p. 3). The most recent activities involved oil refining and used oil storage (Ref. 3, p. 3). A plume of petroleum hydrocarbon-contaminated ground water has been identified in the shallow alluvial aquifer beneath the site. The extent of the ground water plume was determined based on sampling of ground water monitoring wells located on-site and surrounding the site. The ground water plume is approximately 0.08 mile in size, with the majority of the plume located directly beneath the site. Several sources have been identified at the site and include ASTs, drums, an API separator, a sump, and several areas of contaminated soils.
2. The State predecessor agencies: Texas Water Quality Board (TWQB), Texas Department of Water Resources (TDWR), Texas Water Commission (TWC) referred to throughout this documentation record are now known as the Texas Natural Resource Conservation Commission (TNRCC). The new agency became effective 1 September 1993, as mandated under State Senate Bill 2 of the 73rd regular legislative session.
3. The following rules were applied when citing references in this documentation record:
 - A. Tracking numbers are assigned by the region to every page of every reference. The tracking number consists of the reference number followed by the page number within that reference. A tracking number has a two-digit number followed by the sequential number (e.g., 40001, 040002).
 - B. If the reference has an original page number, that page number was cited.
 - C. If the reference cited has no original page number or the pagination is not complete, then the designated tracking number was cited.
 - D. Analytical data are referenced by tracking numbers only.
3. Hazardous substances are listed by the names used in the June 1996 Superfund Chemical Data Matrix (SCDM) (Ref. 2).
4. Attachment A of this documentation record consists of the following figures:
 - A-1 Site Location Map
 - A-2 Site Plan
 - A-3 Historical Ownership - Monarch Refining Company
 - A-4 Historical Ownership - Flint Chemical Corporation

- A-5 Soil Sample Location Map
- A-6 Well Location Map - Shallow Aquifer
- A-7 Estimated Extent of Ground Water Plume
- A-8 Well Location Map - Edwards Aquifer

REFERENCES CITED

1. 40 CFR Part 300, Hazard Ranking System (HRS); Final Rule. 14 December 1990. Volume 55, No. 241.
2. U.S. Environmental Protection Agency (USEPA). 1996. Superfund Chemical Data Matrix (SCDM). June 1996.
3. Ecology and Environment, Inc. (E&E). 1998. Removal Assessment Report for R&H Oil Company Site, San Antonio, Texas. 30 October 1998. Total pages: 251.
4. E&E. 1998. Removal Assessment Report for the Tropicana Energy Company, San Antonio, Texas. 30 October 1998. Total pages: 85.
5. County of Bexar. 1989. Release of Lien and Plat Map for the Eldorado Refining and Marketing, Inc. Site and the Tropicana Energy Company Site. 8 February 1989. Total pages: 3.
6. Texas Natural Resource Conservation Commission (TNRCC). 1995. Industrial and Hazardous Waste Inspection Report. 6 December 1995. Total pages: 12.
7. TNRCC. 1998. Letter from TNRCC to the USEPA, Region 6. Subject: Eldorado Refining and Marketing, Inc. Site. 19 March 1998. Total pages: 5.
8. Raba-Kistner Consultants, Inc. 1991. Phase II Remedial Investigation Report for the Tropicana Energy Company Site. 8 February 1989. Total pages: 40.
9. TNRCC. 1996. Interoffice Memorandum. Subject: Compliance Evaluation Inspection (CEI) conducted at the Eldorado Refining and Marketing, Inc. Site. 1 April 1996. Total pages: 71.
10. Texas Water Commission (TWC). 1988. Interoffice Memorandum. Subject: Special Inspection of the Golden Material and Supply, Inc. Site. 8 September 1988. Total pages: 15.
11. Flint Ink Corporation. 1990. Letter to Mr. Stan Booth, Vice President, Tropicana Energy Company. 10 September 1990. Total pages: 1.
12. Tropicana Energy Company, Inc. 1991. Letter to Mr. Eric Wolff, Raba-Kistner Consultants, Inc. Subject: Sumerset Road Gasoline Spill. 16 May 1991. Total pages: 3.
13. Agreement of Sale and Purchase. 1987. Flint Ink Corporation to Golden Materials and Supply, Inc. 15 September 1987. Total pages: 15.
14. El Dorado Refining and Marketing, Inc. 1989. Letter to the TWC, Registration and Classification

- Unit. Subject: Purchase of Property. 13 March 1989. Total pages: 1.
15. U.S. Department of Energy. 1989. Annual Refinery Report for Eldorado Refining and Marketing, Inc. 13 March 1989. Total pages: 2.
 16. U.S. Bankruptcy Court, Western District of Texas. 1991. Petition for Bankruptcy. 29 January 1991. Total pages: 6.
 17. Bexar Appraisal Real Property Administration. 1993. Account and Owner Inquiry. 19 May 1993. Total pages: 2.
 18. Texas Department of Water Resources (TDWR). 1981. Interoffice Memorandum. Subject: Gasoline Contamination of Gravel Aquifer. 6 April 1981. Total pages: 3.
 19. TDWR. 1983. Oil or Hazardous Material Accidental Discharges or Spill Report. 4 October 1983. Total pages: 5.
 20. TDWR. 1985. Oil or Hazardous Material Accidental Discharges or Spill Report. 5 January 1985. Total pages: 2.
 21. TWC. 1988. Letter to Mr. David Robinson, President, Golden Material and Supply, Inc. Subject: Notice of Solid Waste Violation. 8 September 1988. Total pages: 3.
 22. TNRCC. 2000. Screening Site Inspection Report R&H Oil Company (a.k.a. Eldorado Refining and Marketing, Inc.). June 2000. Total pages: 136.
 23. U.S. Geological Survey (USGS). 7.5-minute topographical series maps. San Antonio East, Texas (1992); San Antonio West, Texas (1993); and Terrell Wells, Texas (1992). Total pages: 3.
 24. Specialized Assays, Inc. 1998. Analytical Reports for R&H Oil Wastestream Samples. 21 July 1998. Total pages: 28.
 25. Roy F. Weston, Inc. 2000. Sample Quantitation Limit Calculations. October 2000. Total pages: 2.
 26. Specialized Assays, Inc. 1998. Analytical Reports for Tropicana Wastestream Samples. 21 July 1998. Total pages: 64.
 27. Specialized Assays, Inc. 1998. Analytical Reports for R&H Soil Samples. 17 July 1998. Total pages: 144.
 28. USGS. 1995. *"Geology and Hydrology of the Edwards Aquifer in the San Antonio Area,*

- Texas.*" Water Resources Investigations Report 95-4186 (excerpts). 1995. Total pages: 14.
29. Texas Board of Water Engineers. 1956. *"Ground-Water Resources of the San Antonio Area, Texas."* Bulletin 5608, Volume I (excerpts). July 1956. Total pages: 7.
 30. USEPA. 1992. Hazard Ranking System (HRS) Guidance Manual; Interim Final (excerpts). November 1992. Total pages: 6.
 31. Texas Board of Water Engineers. 1962. *"Recharge, Discharge, and Changes in Ground-Water Storage in the Edwards and Associated Limestones, San Antonio Area, Texas."* Bulletin 6201 (excerpts). January 1962. Total pages: 16.
 32. Edwards Aquifer Homepage Information. 2001. www.edwardsaquifer.net. January 2001. Total pages: 13.
 33. University of Texas at Austin, Bureau of Economic Geology. 1983. *"Geologic Atlas of Texas; San Antonio Sheet (excerpts)."* 1974. Total pages: 7.
 34. TNRCC. 1998. Record of Communication with Sam Sanchez, Bexar Metropolitan Health District. 13 May 1998. Total pages: 1.
 35. CH2M Hill. 1997. Boring Logs for Monitoring Wells, Kelly Air Force Base, San Antonio, Texas. 7 January 1997. Total pages: 16.
 36. Specialized Assays, Inc. 1998. Analytical Reports for R&H Monitoring Wells. 15 July 1998. Total pages: 42.
 37. Specialized Assays, Inc. 1998. Analytical Reports for Tropicana Monitoring Wells. 15 July 1998. Total pages: 30.
 38. USEPA. 1994. *"Using Qualified Data to Document an Observed Release"* Factsheet. July 1994. Total pages: 14.
 39. Roy F. Weston, Inc. 1999. East Kelly Boundary Control Groundwater Collection and Treatment System, Kelly Air Force Base, Texas, Final Environmental Cleanup Plan (excerpts). October 1999. Total pages: 13.
 40. Registered Well Logs for the State of Texas. Total pages: 89.
 41. Source Water Amendment and Protection Team. 1998. Record of Communication with Tracy Harbour. Subject: San Antonio Wellhead Protection Area. 24 June 1998. Total pages: 1.

42. Roy F. Weston, Inc. 2000. Ground Water Migration Pathway Calculation Worksheets: Shallow Alluvial Aquifer and the Edwards Aquifer. Total pages: 4.
43. Edwards (Balcones Fault Zone) Factsheet. 2001. Total pages: 3.
44. USEPA. 1996. *Waste Minimization for Selected Residuals in the Petroleum Refining Industry.* Office of Solid Waste and Emergency Response. December 1996. Total pages: 69.
45. Cookson, Jr., John. 1995. *Bioremediation Engineering: Design and Application (excerpts).* 1995. Total pages: 4.
46. Kambhu, A. 2001. WESTON. Personal Communication with Gregg Eckhardt, Senior Analyst for the San Antonio Water Systems. Subject: Edwards Aquifer. 9 February 2001. Total pages: 1.
47. USGS. Ground Water and Surface Water - A Single Resource. Excerpt L - Field Studies of Karst Terrain. Circular 1139. Total pages: 4.
48. Kamhbu, A. 2001. WESTON. Personal Communication with Desiderio Raygosa, Production Manager, Bexar Metropolitan Water District. Subject: City of San Antonio Drinking Water Supplies and Edwards Aquifer Information. 20 February 2001. Total pages: 1.
49. Ebert, J. Kelly AFB Environmental Management. Facsimile to Bart Canellas. State of Texas Well Report. Total pages: 4.
50. San Antonio Water System (SAWS). Water Well Report for San Antonio Water System. 30 November 1999. Total pages: 212.

SITE SUMMARY

The R&H Oil Company Site is an abandoned oil refinery and gasoline blending facility located in the southern portion of San Antonio, Bexar County, Texas (Ref. 3, p. 3; Ref. 4, p. 3). Specifically, the refinery was a crude oil and used oil refinery that operated under many different oil/processing companies (Ref. 3, p. 3). The most recent activities involved oil refining and used oil storage (Ref. 3, p. 3). The R&H Oil Company site may have also been referred to as Eldorado Refining and Marketing, Inc. or Tropicana Energy.

The Eldorado Refining and Marketing, Inc. property's physical address is 403 Somerset Road, San Antonio, Texas and is legally described as parts of Lots 21 and 24A and all of Lots 22 and 23, Block 2, New City Block 8727 in the City of San Antonio (Ref. 5, pp. 2-3). The Tropicana Energy property's physical address is 419 Somerset Road, San Antonio, Texas and is legally described as Lots 16B, 16C, 16D, 17B, 18B, and 19B, Block 4, New City Block 8739 in the City of San Antonio (Ref. 4, pp. 3, 40; Ref. 5, pp. 2-3). The site has been subdivided on numerous occasions throughout the course of its operating history. According to files reviewed, the Eldorado refinery was historically part of a refinery which included the 419 Somerset Road facility (i.e., Tropicana) (Ref. 9, p. 12).

It should be noted that each individual facility is capable of scoring above the 28.5 cutoff on its own merit due to the large number of targets available to the ground water migration pathway (Ref. 42, pp. 1-4). Because the wastes at each facility are the same, are located in the immediate proximity of one another, and affect the same targets, both facilities will be considered one site for evaluation purposes under the HRS. Further, the majority of the parcels mentioned above have been owned by the same company on two separate occasions. The site will be referred to as the R&H Oil Company, as listed in CERCLIS. In addition, the two facilities share infrastructure (i.e., piping configurations) that are integral to each of the facility's operations further suggesting that the site was historically one large refinery (Ref. 9, p. 4). There is no physical barrier separating the two properties with the exception of a chain-link fence (Ref. 5, p. 3).

The site is located in a densely populated area of San Antonio. Surrounding land use is mixed commercial, residential, and industrial (Ref. 6, p. 9; Ref. 23, pp. 1-3). Columbia Heights Elementary School is located approximately 0.5 mile southeast of the site. The Dwight Middle School and the Athens Elementary School are located approximately 1 mile southwest of the site. Evidence of trespass across the site is apparent (Ref. 7, p. 3). A Site Location Map is provided as Figure A-1 of Attachment A.

Site Location and Description

The R&H Oil Company site is located approximately 6.5 miles southwest of downtown San Antonio and encompasses a total of 7 acres of land. According to available file information, the refinery appeared to be operating as early as 1938. Structures remaining on site consist of a warehouse building, an office building, a process area, above-ground storage tanks (ASTs) and associated piping, an API separator, a sump, and numerous 55-gallon drums (Ref. 3, pp. 4, 64; Ref. 8, p. 3). Earlier site plans indicated the presence of an emissions collection system with a flare, a tar pit, a condensate pit, and an oil sump in the southern portion of the property, but it has not been confirmed as to whether these structures remain on site (Ref. 8, p. 3). A Site

Plan is provided as Figure A-2 of Attachment A.

The process area is generally located in the northeastern portion of the property. Numerous piping configurations were observed leading to and from the process area to various nearby ASTs during a March 1998 site inspection. Oily liquids beneath the piping were also observed in three different locations within the process area during the March 1998 site inspection (Ref. 7, pp. 2-4). Various wastes, mostly corrosives, were observed in the boiler room during the Compliance Evaluation Inspection (CEI) conducted on 6 December 1995 (Ref. 7, pp. 2-4; Ref. 9, p. 3).

There are approximately 40 ASTs located on the property and their capacities range from 5,000 gallons to 400,000 gallons. The contents and condition of each of the ASTs is not known; however, two of the larger ASTs were observed to be open and filled with sludge in March 1998. In addition, two other ASTs appeared to be leaking substances onto the ground in the central portion of the site during a March 1998 site inspection (Ref. 7, p. 3). A black tar-like material was observed on the ground surface surrounding some of the ASTs during an inspection conducted in March 1988 (Ref. 7, p. 3).

Between 30 and 40 55-gallon drums were observed onsite during a site reconnaissance conducted on 28 April 1997 (Ref. 4, pp. 4, 41). Some of the drums were found to contain combustible liquids, flammable liquids, acid, oil and water mixtures, and chlorinated solvents (Ref. 4, pp. 25-26, 75-83). The drums were observed to be staged directly on the ground without any containment features (Ref. 4, p. 43).

The API separator is located in the north central portion of the property. The API separator is constructed of concrete and is divided into 3 uncovered compartments. Sludge and soils separated from the used oils were placed in the API separator. Wastewaters from the API separator were discharged to the City of San Antonio sewer system. Approximately 3 feet of oily liquid and sludge were observed in each of the three compartments in March 1998 (Ref. 7, p. 3). The sludge in the separator is considered to be a listed hazardous waste (K051), as codified in 40 CFR 261, Subpart D (Ref. 6, p. 4). The ground surrounding the API separator is covered with a tar-like substance (Ref. 7, p. 3).

The sump is an earthen sump located near the northern boundary of the facility. There is no control equipment (berms, etc.) to prevent overflow. The contents of the sump have apparently discharged onto the ground surface surrounding the sump (Ref. 9, pp. 4, 20).

Operational History

The Monarch Refining Company/Wing Corporation owned Lots 23 and 24A, Block 2 of New City Block 8727 and Lots 16B, 16C, 16D, 17B, 18B, and 19B, Block 4 of New City Block 8730 from December 1950 through October 1974. The Monarch Refining Company operated a refinery on these parcels beginning in December 1950 (Ref. 4, pp. 67-74; Ref. 8, p. 2). The refinery produced hydrocarbon products including gasoline, fuel oils, and ink oil (Ref. 8, p. 2). The ownership distribution of the Monarch Refining Company/Wing Corporation is illustrated on Figure A-3 of Attachment A.

The Flint Chemical Company, a division of the Flint Ink Corporation, purchased the aforementioned parcels of land from the Monarch Refining Company in October 1974. The Flint Chemical Company already owned Lots 21 and 22, Block 2 of New City Block 8727 since July 1943 (Ref. 4, pp. 71-72). The Flint Chemical Company continued to operate a refinery on the property and to produce large quantities of hydrocarbon products until April 1978 (Ref. 4, pp. 68-74; Ref. 8, p.2; Ref. 11, p. 1). The ownership distribution of the Flint Ink Chemical Company is illustrated on Figure A-3 of Attachment A.

In April 1978, the Flint Chemical Company sold Lots 16B, 16C, 16D, 17B, 18B, and 19B, Block 4 of New City Block 8730 to the Southland Petroleum Company, Inc. (Ref. 4, pp. 67-70). The Southland Petroleum Company reportedly used the property to distribute petroleum products purchased from the Flint Ink Chemical Company (Ref. 8, p. 2).

When the Southland Petroleum Company liquidated in bankruptcy in August 1984, the Southern State Bank acquired the property (Ref. 4, pp. 67-70). The Tropicana Energy Company then purchased the property in March 1988. The Tropicana Energy Company blended and distributed ethanol in gasoline. The facility received ethanol, gasoline, and various gasoline range components, which were blended for sale as full specification gasoline (Ref. 12, p. 2). The Tropicana Energy Company filed for bankruptcy in 1989 and abandoned the property shortly thereafter (Ref. 4, p. 3; Ref. 22, p. 17).

The Flint Chemical Company sold Lots 21 through 24A to Golden Materials and Supply, Inc. in 1987 (Ref. 13, pp. 1-15). Golden Materials and Supply, Inc. operated as a used oil marketer by reprocessing used oils from various generators. Used oils were collected from service stations, transmission shops, automotive service shops, military installations, crude oil facilities, and municipal and industrial generators (Ref. 10, p. 1). Primarily, the used oils collected and stored on site included automotive oils, lubricating oils, hydraulic oils, transmission oils, cooling oils, and heavy equipment oils (Ref. 7, p. 2).

Incoming oils received by Golden Materials and Supply, Inc. were stored at the site in four 10,000-gallon ASTs prior to being processed and blended. Used oils were processed in a centrifuge to remove any sludge or solids, which were then sent to the API separator. Waste oils separated by the API separator were stored in ASTs. The used oils removed during the centrifuge process were sent to a distillation unit to remove any water. Volatile organics separated at this stage were then condensed and stored in two ASTs (Tanks 105 and 106) prior to blending with other used oils (Ref. 7, p. 2; Ref. 10, p. 1). The reusable used oils were sold to area asphalt plants while the wastes generated from the reprocessing remained on site (Ref. 10, p. 2).

Eldorado Refining and Marketing, Inc. purchased Lots 21 through 24A from Golden Materials and Supply, Inc. in February 1989 (Ref. 14, p. 1). Eldorado converted the refinery operations to perform waste oil re-refining (Ref. 15, pp. 1-2). A gentleman by the name of Mr. Andrew Sanchez financed the purchase for Eldorado Refining and Marketing, Inc. Mr. Sanchez then created a company, T.C. Golden which foreclosed on the property sometime in 1989 (Ref. 9, p. 1). T.C. Golden filed for bankruptcy on 26 September 1990. The bankruptcy case was closed on 29 January 1991 (Ref. 16, pp. 1-6). T.C. Golden was still listed as the owner of Lots 21 through 24A, Block 2 of New City Block 8727 on Bexar County Appraisal District records as of May 1993 (Ref. 17, pp. 1-2).

Regulatory History

During construction activities on 12 November 1980, City Public Service (CPS) of San Antonio encountered contaminated ground water at Highway 81 South and the Missouri Pacific railroad crossing, which is located west of the property. Subsequent investigation of this construction site by the Texas Department of Water Resources (TDWR) in April 1981 revealed the presence of a black, oily liquid having a strong gasoline odor in the shallow aquifer (Ref. 18, pp. 1-2).

A spill of approximately 200 gallons of Maranda crude oil occurred on 4 October 1983 at the site. Maranda crude oil is the base oil for printer's ink (Ref. 19, p. 1). Cleanup of Somerset Road, the adjacent storm sewer, and associated contaminated soils occurred immediately following the spill (Ref. 19, pp. 1-3).

A spill of approximately 200 gallons of waste oil occurred on 5 January 1985 at the site. The spill occurred in the on-site parking lot and adjacent facility grounds and was due to overflow from a holding tank. Reportedly, the spill oil was recovered by facility personnel (Ref. 20, pp. 1-2).

The Texas Natural Resource Conservation Commission (TNRCC) conducted a sampling inspection at the R&H site on 29 July 1987. At the time of the inspection, the property was under the ownership of the Flint Chemical Company, but was found to be vacant and inactive. During this inspection, two waste samples and three soil samples were collected. The waste samples were collected from tank bottoms. Analytical results from the waste samples indicated the presence of total lead at 650 milligrams per kilogram (mg/kg) and terpenes (C_{10} to C_{15}) at 16,400 mg/kg. The three soil samples were collected from the ground surface within the main tank battery. Analytical results from the soil samples indicated the presence of total lead at 36 mg/kg and terpenes at 148 mg/kg (Ref. 9, pp. 5-6).

The TNRCC conducted a special inspection of the site on 24 August 1988. Areas of concern documented during the inspection included: areas of hydrocarbon-stained soils around the ASTs (both inside and outside of the containment areas) and hydrocarbon-stained soils surrounding the API separator and earthen sump. An additional area of concern included the off-site migration of petroleum substances near the railroad car loading racks in the western portion of the site. During the TNRCC's inspection, one waste sample was collected from a tank which was used to store condensate from the distillation unit. Analytical results of this sample indicated the presence of several constituents, including: acetone, benzene, ethylbenzene, naphthalene, toluene, and xylene (Ref. 22, pp. 18-19).

As a result of this inspection, Golden Materials and Supply, Inc. was issued a Notice of Violation (NOV), dated 8 September 1988, for failure to notify the TWC of the generation of API separator sludge, slop oils, and process waste waters. In addition, the NOV documented the failure of the property owner to notify the United States Environmental Protection agency (USEPA) of their used oil fuel activities (Ref. 21, pp. 1-3).

A spill occurred in the southern portion of the property on 18 April 1990. The spill consisted of 8,000 gallons of premium-grade ethanol blended gasoline. It was estimated that the spill affected an area of approximately 700 square yards. Both the TWC and the San Antonio Fire Department were notified of the spill. According

to information reviewed, all of the product spilled was either recovered or trapped in the surface soils (Ref. 8, pp. 3, 4).

A Phase II Remedial Investigation was conducted by Raba-Kistner Consultants, Inc. as a result of the aforementioned spill. The field activities for the Phase II Remedial Investigation were conducted on 18 and 19 April 1990. The objective of the field investigation was to determine the overall horizontal and vertical extent of subsurface contamination. A total of eight soil borings were advanced at the site. The soil borings were advanced to a maximum depth of 54.5 feet below ground surface. Each soil boring was continuously sampled and selected soil samples from each boring were collected for laboratory analysis based on field screening measurements. The soil samples were analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX), total petroleum hydrocarbons (TPH), and total lead (Ref. 8, pp. 4-5).

Six of the soil borings were converted to monitoring wells, MW-1 through MW-6. Ground water samples were collected from each of these six monitoring wells. The ground water samples were also analyzed for BTEX, TPH, and total lead. Analytical results indicated the presence of light to medium-range hydrocarbons in all of the soil and ground water samples. Hydrocarbon free-product was encountered during drilling activities, but was not detected as a free-phase floating product in any of the monitoring wells after their completion and development (Ref. 8, pp. 4-7).

A Compliance Evaluation Inspection (CEI) was conducted by the TNRCC on 6 December 1995. A total of six samples were collected, including: one liquid and one sediment sample each from the sump, three sludge samples from the API separator, and one soil sample located near the railroad spur. Analytical results from these samples indicated the presence of the following constituents: barium, benzene, chromium, ethylbenzene, lead, 2-methylnaphthalene, naphthalene, toluene, and total xylene (Ref. 9, pp. 6-9).

A site inspection was conducted by the TNRCC as part of the EPA Region 6 Multi-Site Cooperative Agreement PA/SI Program on 17 March 1998. The site inspection mainly involved observing and documenting the current conditions of the property. No sampling was performed during this investigation. Areas of concern noted during this inspection were similar to those documented during the August 1998 TNRCC inspection (Ref. 7, pp. 2-4).

In April 1998, the USEPA tasked the Superfund Technical Assistance and Response Team (START) contractor to perform removal assessments at the Eldorado site and the Tropicana site concurrently. Removal assessment activities were conducted from 6 July through 13 July 1998. The objective of the removal assessment was to collect multi-media samples from various on-site, off-site, and background locations in order to estimate the volumes of waste present, determine waste streams, and evaluate disposal options, if applicable. Even though these investigations were categorized as "removal assessments", no wastes were actually removed from either site. According to the reports, specific activities conducted during each removal assessment included multi-media sampling and field hazardous waste characterization. The Eldorado Refining and Marketing, Inc. (R&H Oil) Removal Assessment report is provided as Reference 3. The Tropicana Energy Company Removal Assessment is provided as Reference 4.

The START team collected oil and sludge samples from on-site drums and ASTs, soil samples from on-site and off-site areas, ground water samples from monitoring and drinking water wells, and asbestos samples from on-site piping structures. Samples collected as part of the removal assessment were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and cyanide (Ref. 3, pp. 4-6, 19-20; Ref. 4, pp. 4-5, 15-16). Analytical results of the waste stream and soil samples indicated the presence of VOCs, SVOCs, and metals at elevated concentrations (Ref. 3, pp. 9-20, 24-25, 27-28, 41-44, 49, 55; Ref. 4, pp. 19-21, 24, 26-28, 34). The ground water samples collected from monitoring wells indicated the presence of benzene, ethylbenzene, naphthalene, phenol, toluene, xylene, arsenic, barium, manganese, and zinc (Ref. 3, pp. 3, 17-18; Ref. 4, pp. 6-11, 14).

The TNRCC conducted a Screening Site Inspection (SSI) at the site in July 1998. The objective of the SSI was to determine if sufficient information existed to adequately characterize the waste sources at the site as well as to determine if an observed release to the ground water, surface water, soil, or air had occurred that could be attributed to sources at the site. The Screening Site Inspection report has been included as Reference 22.

WORKSHEET FOR COMPUTING HRS SITE SCORE

		<u>S</u>	<u>S²</u>
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	100	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	NS
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	NS
2c.	Surface Water Migration Pathway Score (S_{sw}) (Enter the larger of the lines 2a and 2b as the pathway score)	NS	NS
3.	Soil Exposure Pathway Score (S_g) (from Table 5-1, line 22)	NS	NS
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	NS
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_g^2 + S_a^2$	----	10,000
6.	HRS Site Score: Divide the value on line 5 by 4 and take the square root.	50	

Notes:

S Score
S² Score squared
NS Not Scored

Tables 3-1, 4-1, 4-25, 5-1, and 6-1 refer to scoresheets presented in the HRS Rule (Ref. 1). Table 4-1 is reproduced in the

following pages of this documentation record for the convenience of the reader.

TABLE 3-1^d
GROUND WATER MIGRATION PATHWAY SCORESHEET

<u>Factor Categories and Factors</u>		<u>Maximum Value</u>	<u>Value Assigned</u>
Likelihood of Release to an Aquifer:			
1.	Observed Release	550	NS
2.	Potential to Release:		
2a.	Containment	10	10
2b.	Net Precipitation	10	1
2c.	Depth to Aquifer	5	1
2d.	Travel Time	35	1
2e.	Potential to Release [lines 2a(2b + 2c + 2d)]	500	30
3.	Likelihood of Release (higher of lines 1 and 2c)	550	30
Waste Characteristics:			
4.	Toxicity/Mobility	(a)	10,000
5.	Hazardous Waste Quantity	(a)	100
6.	Waste Characteristics	100	32
Targets:			
7.	Nearest Well	50	20
8.	Population		
8a.	Level I Concentrations	(b)	0
8b.	Level II Concentrations	(b)	0
8c.	Potential Contamination	(b)	13,414
8d.	Population (lines 8a + 8b + 8c)	(b)	13,414
9.	Resources	5	5
10.	Wellhead Protection Area	20	5
11.	Targets (lines 7 + 8d + 9 + 10)	(b)	13,444

TABLE 3-1^d
GROUND WATER MIGRATION PATHWAY SCORESHEET

Ground Water Migration Score for an Aquifer:

12.	Aquifer Score	100	100
	[(lines 3 x 6 x 11)/82,500] ^c		

Ground Water Migration Pathway Score:

13.	Pathway Score	100	100
-----	---------------	-----	-----

Notes:

- (a) Maximum value applies to waste characteristics category.
- (b) Maximum value not applicable.
- (c) Do not round to the nearest integer.
- (d) Table 3-1 refers to scoresheets presented in the Federal Register (i.e., HRS Final Rule) (Ref. 1).
- NS Not Scored.

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 1

Name and description of the source: Above-ground storage tanks (ASTs)

The following ASTs have been characterized and evaluated as one source since their contents were determined to be similar through field hazardous waste characterization: 103, 104, 105, 110, 113, 201, 204, 208, 209, 302, and 303. A total of eleven steel ASTs comprise this source. Some of the ASTs are circular in shape while others are rectangular in shape. The contents and condition of each of the ASTs is not known; however, some of the ASTs were observed to be open and filled with a thick sludge material during the July 1998 Removal Assessment. Based on information reviewed of the field hazardous waste characterization, the contents of the ASTs were described as a black, oily liquid with sediment or sludge in the bottom (Ref. 3, pp. 197-199, 202, 205, 206, 208, 211-212, 217-218). The START contractor inventoried a number of the ASTs during the Removal Assessment (Ref. 3, pp. 45-47). A summary of the inventory pertaining to these eleven ASTs is presented in the following table.

AST INVENTORY

Tank Number	Dimension (feet)	Tank Capacity (gallons)	Depth of Waste (inches)	Volume of Waste (gallons)	References
T-103	30 x 10	17,624	14	180	Ref. 3, pp. 45-46
T-104	30 x 10	17,624	6	66	Ref. 3, pp. 45-46
T-105	32 x 6	6,768	3	12	Ref. 3, pp. 45-46
T-110	11 x 12	9306	8	564	Ref. 3, pp. 45-46
T-113	9 x 19	19087	52	9190	Ref. 3, pp. 45-46
T-201	18 x 21	46634	1	----	Ref. 3, pp. 45-46
T-204	20 x 30	105746	8	3525	Ref. 3, pp. 45-46
T-208	22 x 22	62555	18	4265	Ref. 3, pp. 45-46
T-209	22 x 22	62555	2	474	Ref. 3, pp. 45-46
T-302	40 x 43	434499	10	9052	Ref. 3, pp. 45-46
T-303	40 x 43	434499	14	12673	Ref. 3, pp. 45-46

Some of the ASTs were once used to store waste oils, sludges, and process wastewaters generated during the refining process (Ref. 9, p. 4; Ref. 21, p. 2). Other ASTs were used to store condensate which is a by-product of the refining distillation process (Ref. 9, p. 5; Ref. 10, p. 1). Because the contents of the tanks are wastes and by-products of the refining process and not intended to be sold or used as a petroleum product, this source will be considered CERCLA eligible and available for evaluation under the HRS.

Location of the source with reference to a map of the site:

The ASTs that characterize Source 1 are located in the northern portion of the property within the main tank battery. ASTs 103, 104, and 105 are located immediately northeast of the office building within the process area. AST 110 and AST 113 are located immediately north of the warehouse. ASTs 201, 204, 208, and 209 are located near the pump house near the northern property boundary. ASTs 302 and 303 are located east of the Missouri Pacific Railroad line and west of the warehouse (Ref. 3, p. 64). A Site Plan is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of ASTs and will be classified and evaluated as the HRS source type "above-ground tank."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Release to ground water: There is believed to be no liner or other containment features associated with these ASTs; however, this could not be verified based on the available information. According to information reviewed, petroleum-contaminated ground water was encountered by a construction crew near the northwestern portion of the site (Ref. 18, p. 1; Ref. 22, p. 18). The ground water encountered apparently had a strong gasoline odor (Ref. 22, p. 18). A sample was collected at the time of its discovery and consisted of approximately 50% water and 50% black, oily liquid (Ref. 18, p. 1). The source of contamination could not be determined; however, the presence of the petroleum contamination in the ground water may be an indication that there are no containment features associated with the ASTs.

In addition, ground water samples were collected from monitoring wells located in the southern portion of the site in 1991. The analytical results indicated the presence of light to mid-range hydrocarbons in the shallow

ground water. Hydrocarbons were detected in monitoring wells located along the perimeter of the site as well as an upgradient well (Ref. 8, pp. 5-6).

Because of the presence of petroleum contamination in the ground water, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: Apparent hydrocarbon seeps and stained soils observed around the base of a number of these ASTs may be an indication that they have been leaking (Ref. 7, p. 3; Ref. 22, p. 21). Subsurface soil samples were collected from the site in 1991. Apparent free product was present in the soils in several of the subsurface soil samples (Ref. 8, p. 6). A large portion of the hydrocarbons encountered in the soils are reportedly from products similar to diesel oil or ink oil (Ref. 8, p. 7). Surface soil samples were also collected from the site in July 1998. Various hazardous substances were detected in these soil samples, including: benzene, fluoranthene, isopropylbenzene, pyrene, arsenic, cobalt, copper, mercury, selenium, and zinc.

Although areas of contaminated soil have been identified at the site and there is evidence of unauthorized trespass on the property, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1, 3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Even though areas of contaminated soils have been identified at the site, soil exposure was not scored as scoring the ground water pathway alone was sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

Two sludge samples, RH-WS01 and RH-WS01A (a duplicate), were collected on 12 July 1998 during the Removal Assessment. Both samples were composite samples collected from ASTs 103, 104, 105, 110, 113, 201, 204, 208, 209, 302, and 303 as their contents were determined to be similar through field hazardous waste characterization (Ref. 3, pp. 186, 191, 193, 197-199, 202, 205-206, 208, 211-212, 217-218).

The sludge samples were analyzed by Specialized Assays, Inc. for the following constituents (Ref. 3, p. 45):

C	VOCs
C	SVOCs
C	Pesticides/PCBs
C	Total Metals/Cyanide
C	Toxicity Characteristic Leaching Procedure (TCLP) VOCs
C	TCLP SVOCs
C	TCLP Pesticides/Herbicides
C	TCLP Total Metals

C General Chemistry (reactive cyanide, reactive sulfide, ignitability, corrosivity, and total halides)

Sample quantitation limits (SQLs) were not calculated because the information necessary to perform the calculation was not provided in the laboratory analytical results. Therefore, the laboratory detection limit will be used in place of the SQL per HRS Rule, Section 2.3 (Ref. 1, Sec. 2.3). It should be noted that both Quality Assurance/Quality Control (QA/QC) summary forms, result summaries, and chain of custody forms for the two sludge samples are included as Reference 24.

As such, the constituents presented in the following table provide evidence of the hazardous substances associated with Source 1. The location of each of the ASTs is illustrated in Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Benzene	RH-WS01	3,380 ug/kg (1,000)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	4,880 ug/kg (1,000)	
Ethylbenzene	RH-WS01	13,300 ug/kg (1,000)	Ref. 3, pp. 45, 191, 193 Ref. 9, pp. 5-6; Ref. 24, pp. 1-10
	RH-WS01A	17,500 ug/kg (1,000)	
Tetrachloroethene	RH-WS01	2,060 ug/kg (1,000)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	2,910 ug/kg (1,000)	
Toluene	RH-WS01	31,400 ug/kg (1,000)	Ref. 3, pp. 45, 191, 193 Ref. 9, pp. 5-6 Ref. 24, pp. 1-10
	RH-WS01A	44,000 ug/kg (1,000)	
Arsenic	RH-WS01	1.8 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	1.2 mg/kg (1)	
Barium	RH-WS01	12.7 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	12.3 mg/kg (1)	
Cadmium	RH-WS01	1.8 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	1.7 mg/kg (1)	
Chromium	RH-WS01	2.9 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	2.7 mg/kg (1)	
Copper	RH-WS01	63.5 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	59.6 mg/kg (1)	

Notes:

mg/kg milligrams per kilogram
ug/kg micrograms per kilogram
DL Detection limit.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1 (Continued)

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Lead	RH-WS01	71.4 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	70.6 mg/kg (1)	
Manganese	RH-WS01	4.3 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	4.2 mg/kg (1)	
Nickel	RH-WS01	1.8 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	1.7 mg/kg (1)	
Selenium	RH-WS01	1.8 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	1.5 mg/kg (1)	
Zinc	RH-WS01	512 mg/kg (1)	Ref. 3, pp. 45, 191, 193 Ref. 24, pp. 1-10
	RH-WS01A	483 mg/kg (1)	

Note:

mg/kg milligrams per kilogram

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 1 is greater than 0, the following hazardous substances are available to the ground water pathway: benzene, ethylbenzene, tetrachloroethene, toluene, arsenic, barium, cadmium, chromium, copper, lead, manganese, nickel, selenium, and zinc.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 1 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 of this documentation record lists the hazardous substances associated with Source 1. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substances associated with Source 1 potentially posing the greatest hazard is are lead, manganese, and nickel. (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 1 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The ASTs that comprise Source 1 were inventoried during the July 1998 Removal Assessment. The amount of material in each of the ASTs that characterize this source was measured. The ASTs were determined to have a combined wastestream quantity of approximately 40,000 gallons (Ref. 3, pp. 45-47). Therefore, this quantity will be used to evaluate the Hazardous Waste Quantity under Tier B according to the HRS Rule, Table 2-5 (Ref. 1, Sec. 2.4.2.1.3).

$$40,000 \text{ gallons} \times 10 \text{ pounds/gallon} = 400,000 \text{ pounds}$$

$$400,000 \text{ pounds} / 5,000 = 80$$

Wastestream Quantity of Source: 40,000 gallons
Wastestream Assigned Value: 80

2.4.2.1.3 Volume (Tier C) - Not Calculated

Volume (Tier C) was not calculated since a hazardous wastestream quantity (Tier B) was already calculated for the source (Ref. 1, Sec. 2.4.2.13).

2.4.2.1.4 Area (Tier D) - Not Calculated

Area (Tier D) was not calculated since a hazardous wastestream quantity (Tier B) was already calculated for the source.

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, hazardous wastestream quantity (Tier B) was the only tier evaluated for Source 1. Therefore, the hazardous wastestream quantity value will be assigned as the source hazardous waste quantity value for Source 1 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 1 VALUES
A	NC
B	80
C	NC
D	NC

Source Hazardous Waste Quantity Factor Value: 80

SOURCE CHARACTERIZATION

2.2 SOURCE DESCRIPTION

2.2.1 Source Identification

Number of the source: 2

Name and description of the source: Above-ground storage tank (AST) 111

Source 2 is composed of AST 111 which is a circular-shaped steel tank. AST 111 measures 26 feet by 11 feet and has a total estimated capacity of 18,482 gallons (Ref. 3, pp. 45-46). Approximately 8 inches of a black, oily liquid, was measured in the tank during the July 1998 Removal Assessment (Ref. 3, pp. 186, 203). The black liquid was determined to be a mixture of oil and acid through field hazardous waste characterization (Ref. 3, pp. 203).

The black, oily liquid in the AST is likely a by-product of the refining process and not intended to be sold as a petroleum product. Because the contents of AST 111 is a by-product, it will be considered a CERCLA eligible source and available for evaluation under the HRS.

Location of the source with reference to a map of the site:

AST 111 is located immediately north of the warehouse in the northern portion of the site (Ref. 3, p. 64). A Site Plan is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of an AST and will be classified and evaluated as the HRS source type "above-ground tank."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: There is believed to be no liner or other containment features associated with these ASTs; however, this could not be verified based on the available information. According to information reviewed, petroleum-contaminated ground water was encountered by a construction crew near the northwestern portion of the site (Ref. 18, p. 1; Ref. 22, p. 18). The ground water encountered apparently had a strong gasoline odor (Ref. 22, p. 18). A sample was collected at the time of its discovery and consisted of

approximately 50% water and 50% black, oily liquid (Ref. 18, p. 1). The source of contamination could not be determined; however, the presence of the petroleum contamination in the ground water may be an indication that there are no containment features associated with the ASTs.

In addition, ground water samples were collected from monitoring wells located in the southern portion of the site in 1991. The analytical results indicated the presence of light to mid-range hydrocarbons in the shallow ground water. Hydrocarbons were detected in monitoring wells located along the perimeter of the site as well as an upgradient well (Ref. 8, pp. 5-6).

Because of the presence of petroleum contamination in the ground water, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: Subsurface soil samples were collected from the site in 1991. Apparent free product was present in the soils in several of the subsurface soil samples (Ref. 8, p. 6). A large portion of the hydrocarbons encountered in the soils are reportedly from products similar to diesel oil or ink oil (Ref. 8, p. 7). Surface soil samples were also collected from the site in July 1998. Various hazardous substances were detected in these soil samples, including: benzene, fluoranthene, isopropylbenzene, pyrene, arsenic, cobalt, copper, mercury, selenium, and zinc.

Although areas of contaminated soil have been identified at the site and there is evidence of unauthorized trespass on the property, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1, 3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Even though areas of contaminated soil have been identified at the site, soil exposure was not scored as scoring the ground water pathway alone is sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

One liquid sample, RH-WS03, was collected from AST 111 on 12 July 1998 during the Removal Assessment. The sample was analyzed by Specialized Assays, Inc. for the following constituents (Ref. 3, pp. 45-47):

C	VOCs
C	SVOCs
C	Pesticides/PCBs
C	Total Metals/Cyanide
C	Toxicity Characteristic Leaching Procedure (TCLP) VOCs
C	TCLP SVOCs

- C TCLP Pesticides/Herbicides
- C TCLP Total Metals
- C General Chemistry (reactive cyanide, reactive sulfide, ignitability, corrosivity, and total halides)

SQLs were not calculated for this sample because the information necessary to perform the calculation was not provided in the laboratory analytical reports. Therefore, the detection limit will be used in place of the SQL per HRS Rule, Section 2.3 (Ref. 1, Sec. 2.3). It should be noted that sample RH-WS03 had a dilution factor of 500 for VOCs and 100 for SVOCs (Ref. 24, pp. 16 -17). QA/QC summary forms, result summaries, and chain of custody forms for this sample are included as Reference 24.

As such, the constituents presented in the following table provide evidence of the hazardous substances associated with Source 2. The location of the AST is illustrated on Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 2

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Arsenic	RH-WS03	1.8 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 20
Selenium	RH-WS03	2.0 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 20

Notes:

mg/kg milligrams per kilogram.
DL Detection limit.

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 2 is greater than 0, the following hazardous substances are available to the ground water pathway: arsenic and selenium.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 2 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 lists the hazardous substances associated with Source 2. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substance associated with Source 2 potentially posing the greatest hazard is arsenic (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 2 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The amount of material in AST 111 was measured to be approximately 474 gallons and determined to be acid through field hazardous waste characterization (Ref. 3, pp. 45-47, 203). Therefore, this wastestream quantity will be used to evaluate the Hazardous Waste Quantity under Tier B according to the HRS Rule, Table 2-5 (Ref. 1, Sec. 2.4.2.1.3).

$$474 \text{ gallons} \times 10 \text{ pounds/gallons} = 4,740 \text{ pounds}$$

$$4,740 \text{ pounds} / 5,000 = 0.948$$

Wastestream Quantity of Source: 474 gallons

Wastestream Quantity Assigned Value: 0.948

2.4.2.1.3 Volume (Tier C) - Not Calculated

Volume (Tier C) was not calculated because a hazardous wastestream quantity for the source has been calculated.

2.4.2.1.4 Area (Tier D) - Not Calculated

Area (Tier D) was not calculated because a hazardous wastestream quantity for the source has been calculated.

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, hazardous wastestream quantity (Tier B) was the only tier evaluated for Source 2. Therefore, the hazardous wastestream quantity will be assigned as the source hazardous waste quantity value for Source 2 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 2 VALUES
A	NC
B	0.948
C	NC
D	NC

Source Hazardous Waste Quantity Factor Value: 0.948

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 3

Name and description of the source: Above-ground storage tank (AST) 207

Source 3 is composed of AST207, which is a steel, circular-shaped tank that measures approximately 22 feet by 22 feet. The tank has a total estimated capacity of 62,555 gallons (Ref. 3, pp. 45-47). Approximately 711 gallons of a black, viscous sludge was measured in AST 207 during the July 1998 Removal Assessment (Ref. 3, pp. 45-47, 210).

There are no available records indicating the use of AST 207. However, the ASTs on site were used to store wastes and sludges separated by the API separator and condensate from the distillation of used oils (Ref. 7, p. 2). The sludge observed in AST 207 is an apparent waste, or by-product, of the refining process and not intended to be sold as a petroleum product. Because the contents of AST 207 consist of sludge, this source will be considered CERCLA eligible and available to be evaluated under the HRS.

Location of the source with reference to a map of the site:

AST 207 is located in the northwest corner of the main tank battery, which is located near the northern property boundary of the site (Ref. 3, p. 64). A Site Plan is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of an AST and will be classified and evaluated as the HRS source type "above-ground storage tank."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: There is believed to be no liner or other containment features associated with these ASTs; however, this could not be verified based on the available information. According to the

information reviewed, petroleum-contaminated ground water was encountered by a construction crew near the northwestern portion of the site (Ref. 18, p. 1; Ref. 22, p. 18). The ground water encountered apparently had a strong gasoline odor (Ref. 22, p. 18). A sample was collected at the time of its discovery and consisted of approximately 50% water and 50% black, oily liquid (Ref. 18, p. 1). The source of contamination could not be determined; however, the presence of petroleum contamination in the ground water may be an indication that there are no containment features associated with the ASTs.

In addition, ground water samples were collected from monitoring wells located in the southern portion of the site in 1991. The analytical result indicated the presence of light to mid-range hydrocarbons in the shallow ground water. Hydrocarbons were detected in monitoring wells located along the perimeter of the site as well as an upgradient well (Ref. 8, pp. 5-6).

Because of the presence of petroleum contamination in the ground water, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: Subsurface soil samples were collected from the site in 1991. Apparent free product was present in the soils in several of the subsurface soil samples (Ref. 8, p. 6). A large portion of the hydrocarbons encountered in the soils are reportedly from products similar to diesel oil or ink oil (Ref. 8, p. 7). Surface soil samples were also collected from the site in July 1998. Various hazardous substances were detected in these soil samples, including: benzene, fluoranthene, isopropylbenzene, pyrene, arsenic, cobalt, copper, mercury, selenium, and zinc.

Although areas of contaminated soil have been identified at the site and there is evidence of unauthorized trespass on the property, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1, 3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Even though areas of contaminated soil have been identified at the site, soil exposure was not scored since scoring the ground water pathway alone is sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

One sample, RH-WS07, was collected from AST207 on 12 July 1998 during the Removal Assessment. The sample consisted of a black, sludge-like material. The sample was analyzed by Specialized Assays, Inc. for the following constituents (Ref. 3, pp. 45-47, 193):

C	VOCs
C	SVOCs
C	Pesticides/PCBs

- C Total Metals/Cyanide
- C Toxicity Characteristic Leaching Procedure (TCLP) VOCs
- C TCLP SVOCs
- C TCLP Pesticides/Herbicides
- C TCLP Total Metals
- C General Chemistry (reactive cyanide, reactive sulfide, ignitability, corrosivity, and total halides)

SQLs were calculated for this particular sample as the information necessary to perform the calculation was available. SQL calculations are provided as Reference 25. QA/QC summary forms, result summaries, and chain of custody forms for this sample are included as Reference 24.

As such, the constituents presented in the following table provide evidence of the hazardous substances associated with Source 3. The location of the AST is illustrated on Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 3

SUBSTANCE	SAMPLE ID	CONCENTRATION (SQL)	REFERENCES
Benzo(a)anthracene	RH-WS07	4,320 ug/kg (428.57)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 25; Ref. 25, p. 1
Benzo(b)fluoranthene	RH-WS07	4,320 ug/kg (428.57)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 25; Ref. 25, p. 1
Chrysene	RH-WS07	4,320 ug/kg (428.57)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 25; Ref. 25, p. 1
Fluoranthene	RH-WS07	4,320 ug/kg (428.57)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 25; Ref. 25, p. 1
Pyrene	RH-WS07	4,320 ug/kg (428.57)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 26; Ref. 25, p. 1
Toluene	RH-WS07	97.1 ug/kg (12.98)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 24; Ref. 25, p. 1
Aluminum	RH-WS07	2,560 ug/kg (0.0052)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Arsenic	RH-WS07	23 ug/kg (0.0026)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Barium	RH-WS07	1,090 ug/kg (0.052)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Cadmium	RH-WS07	3 ug/kg (0.0013)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Chromium	RH-WS07	40 ug/kg (0.0026)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Cobalt	RH-WS07	96 ug/kg (0.0013)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Copper	RH-WS07	149 ug/kg (0.0065)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Lead	RH-WS07	238 ug/kg (0.013)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Manganese	RH-WS07	134 ug/kg (0.0039)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Nickel	RH-WS07	32 ug/kg (0.0104)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Selenium	RH-WS07	3 ug/kg (0.0013)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Zinc	RH-WS07	1,150 ug/kg (0.0052)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1
Cyanide	RH-WS07	3 ug/kg (0.0065)	Ref. 3, pp. 45-47, 193; Ref. 24, p. 28; Ref. 25, p. 1

Notes:

ug/kg micrograms per kilogram.
SQL Sample quantitation limit.

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 3 is greater than 0, the following hazardous substances are available to the ground water pathway: benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, pyrene, toluene, aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, selenium, zinc, and cyanide.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 3 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 lists the hazardous substances associated with Source 3. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substance associated with Source 3 potentially posing the greatest hazard is benzo(b)fluoranthene (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 3 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

AST 207 was determined to contain approximately 711 gallons of waste material (Ref. 3, pp. 45-47). The contents of AST 207 were described as a black, viscous material (Ref. 3, p. 210). Therefore, this wastestream quantity will be used to evaluate the Hazardous Waste Quantity under Tier B according to the HRS Rule, Table 2-5 (Ref. 1, Sec. 2.4.2.1.3).

$$711 \text{ gallons} \times 10 \text{ pounds/gallon} = 7,110 \text{ pounds}$$

$$7,110 \text{ pounds} / 5,000 = 1.42$$

Wastestream Quantity of Source: 711 gallons
Wastestream Assigned Value: 1.42

2.4.2.1.3 Volume (Tier C) - Not Calculated

Volume (Tier C) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.4 Area (Tier D) - Not Calculated

Area (Tier D) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, hazardous wastestream quantity (Tier B) was the only tier evaluated for Source 3. Therefore, the hazardous wastestream quantity will be assigned as the source hazardous waste quantity value for Source 3 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 3 VALUES
A	NC
B	1.42
C	NC
D	NC

Source Hazardous Waste Quantity Factor Value: 1.42

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 4

Name and description of the source: Drums

Approximately forty 55-gallon steel and polyurethane drums have been observed onsite during various site inspections. However, only a portion of the drums were inventoried during the July 1998 Removal Assessment. The contents of ten drums were assessed through field hazardous waste characterization (Ref. 3, pp. 45-47, 194-196; Ref. 4, pp. 25-26, 75-83). It should be noted that the field hazardous waste characterization was performed for potential waste disposal rather than to determine the specific contents of each drum. A summary of the drum inventory is presented in the following table.

DRUM INVENTORY

DRUM	TOTAL CAPACITY OF DRUM	ESTIMATED VOLUME IN DRUM	CONTENTS	REFERENCES
D-01	55-gallon	2 gallons	Combustible Liquid	Ref. 4, pp. 25-26, 75
D-02	55-gallon	28 gallons	Combustible Liquid	Ref. 4, pp. 25-26, 76
D-03	55-gallon	18 gallons	Flammable Liquid	Ref. 4, pp. 25-26, 77
D-08	55-gallon	3 gallons	Combustible Liquid	Ref. 4, pp. 25-26, 79
D-09	55-gallon	14 gallons	Acid	Ref. 4, pp. 25-26, 80
D-26	55-gallon	7 gallons	Combustible Liquid	Ref. 4, pp. 25-26, 82
D-27	55-gallon	2 gallons	Combustible Liquid	Ref. 4, pp. 25-26, 83
Drum 01	55-gallon	unknown	Oil and Water	Ref. 3, pp. 45-47, 194
Drum 02	55-gallon	10 gallons	Oil	Ref. 3, pp. 45-47, 195
Drum 03	55-gallon	25 gallons	Flammable Liquid	Ref. 3, pp. 45-47, 196
TOTAL VOLUME OF MATERIAL MEASURED IN DRUMS = 109 gallons				

Most of the drums have been abandoned at the site for more than six years. Due to this fact, the TNRCC considers the contents of the drums as wastes (Ref. 9, pp. 3-4). Further, it does not appear that the contents of the drums were intended to be sold as petroleum products. As such, this source will be considered CERCLA eligible and available for evaluation under the HRS.

Location of the source with reference to a map of the site:

The drums are located at various places onsite, including: the north side of the warehouse, the central portion of the site, along the eastern property boundary, and in the far southern portion of the site (Ref. 4, p. 41). A Site Plan, including the approximate location of the drums, is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of steel and polyurethane drums and will be classified and evaluated as the HRS source type "drum."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: One of the 55-gallon drums stored onsite was corroded. This drum reportedly contained an unknown substance (Ref. 9, p. 3). The contents and condition of the remaining drums are unknown. Based on photographs of the site, the drums are located directly on the ground surface without any containment features associated with the drums (Ref. 4, p. 43). Further, the drums do not appear to be protected from the elements and are likely subject to corrosion.

Due to a lack of containment features, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: Subsurface soil samples were collected from the site in 1991. Apparent free product was present in the soils in several of the subsurface soil samples (Ref. 8, p. 6). A large portion of the hydrocarbons encountered in the soils are reportedly from products similar to diesel and ink oils (Ref. 8, p. 7).

Although areas of contaminated soil have been identified at the site and there is evidence of unauthorized trespass on the property, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1, 3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Even though areas of soil contamination have been identified at the site, soil exposure was not scored as scoring the ground water pathway alone is sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

Six wastestream composite samples were collected from the ten drums inventoried during the Removal Assessment conducted in July 1998 (Ref. 3, pp. 45-47; Ref. 4, pp. 25-26, 66). Sample TP-WS01 was composited from drums D-01, D-02, D-08, D-26, and D-27 (Ref. 4, pp. 26, 66). Sample TP-WS03 was collected from drum D-09 (Ref. 4, pp. 26, 66). Sample TP-WS05 was collected from drum D-03 (Ref. 4, pp. 26, 66). Sample RH-WS01 was collected from Drum 02 (Ref. 3, pp. 47, 193). Sample RH-WS02 was collected from Drum 01 (Ref. 3, pp. 47, 193). Sample RH-WS05 was collected from Drum 03 (Ref. 3, pp. 47, 193). Samples RH-WS01, RH-WS03, TP-WS01, and TP-WS05 were analyzed as soil samples (Ref. 24, pp. 1, 11; Ref. 26, pp. 1, 13). Samples RH-WS05, TP-WS03, and TP-WS04 were analyzed as water samples (Ref. 24, p. 22; Ref. 26, pp. 11, 12). The samples were analyzed by Specialized Assays, Inc. for the following constituents (Ref. 3, pp. 45-47; Ref. 4, p. 25):

C	VOCs
C	SVOCs
C	Pesticides/PCBs
C	Total Metals/Cyanide
C	Toxicity Characteristic Leaching Procedure (TCLP) VOCs
C	TCLP SVOCs
C	TCLP Pesticides/Herbicides
C	TCLP Total Metals
C	General Chemistry (reactive cyanide, reactive sulfide, ignitability, corrosivity, and total halides)

SQLs were not calculated because the information necessary to perform the calculation was not provided in the laboratory analytical reports. QA/QC summary forms, result summaries, and chain of custody forms for the wastestream samples are included as References 24 and 26.

As such, the constituents presented in the following table provide evidence of the hazardous substances associated with Source 4. The various locations of the drums are illustrated in Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 4

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Benzene	TP-WS05	1,540 ug/kg (200)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66; Ref. 24, p. 1; Ref. 26, pp. 13-17
	RH-WS01	3,380 ug/kg (1,000)	
2-Butanone	TP-WS03	3,280 ug/l (200)	Ref. 4, pp. 25-26, 66; Ref. 26, pp. 11-12
Ethylbenzene	TP-WS01	9,000 ug/kg (200)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66; Ref. 24, p. 1; Ref. 26, pp. 13-17
	TP-WS05	16,300 ug/kg (1,000)	
	RH-WS01	13,300 ug/kg (1,000)	
Tetrachloroethene	TP-WS01	2,840 ug/kg (200)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66; Ref. 24, p. 1; Ref. 26, pp. 13-17
	TP-WS05	2,460 ug/kg (1,000)	
	RH-WS01	2,060 ug/kg (1,000)	
Toluene	TP-WS01	4,180 ug/kg (200)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66; Ref. 24, p. 1; Ref. 26, pp. 13-17
	TP-WS05	16,500 ug/kg (1,000)	
	RH-WS01	31,400 ug/kg (1,000)	
1,1,1-Trichloroethene	TP-WS05	2,060 ug/kg (1,000)	Ref. 4, pp. 25-26, 66; Ref. 26, pp. 13-17
2-Methylphenol	TP-WS05	236,000 ug/kg (100,000)	Ref. 4, pp. 25-26, 66; Ref. 26, pp. 13-17
m,p-Methylphenol	TP-WS05	107,000 ug/kg (100,000)	Ref. 4, pp. 25-26, 66; Ref. 26, pp. 13-17
Antimony	TP-WS05	3.0 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66; Ref. 24, p. 1; Ref. 26, pp. 13-17
	RH-WS01	1 mg/kg (1)	

Notes:

- Samples RH-WS05 and TP-WS03 were analyzed as a liquid matrix (Ref. 26, pp. 1, 11-12).
 - Samples RH-WS01, TP-WS01, and TP-WS05 were analyzed as a solid/sludge matrix (Ref. 24, p. 1; Ref. 26, p. 13).
- ug/l micrograms per liter.
ug/kg micrograms per kilogram.
DL Detection limit.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 4 (Continued)

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Arsenic	TP-WS05	2.2 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 13-17
	RH-WS01	1.8 mg/kg (1)	
	RH-WS02	1.9 mg/kg (1)	
Barium	TP-WS01	10.6 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5
	RH-WS01	12.7 mg/kg (1)	
	RH-WS02	7.5 mg/kg (1)	
Cadmium	TP-WS01	1.2 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	3.8 mg/kg (1)	
	RH-WS01	1.8 mg/kg (1)	
Chromium	TP-WS01	2.6 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	3.0 mg/kg (1)	
	RH-WS01	2.9 mg/kg (1)	
	RH-WS02	6.2 mg/kg (1)	
Copper	TP-WS01	49.6 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	71.2 mg/kg (1)	
	RH-WS01	63.5 mg/kg (1)	
	RH-WS02	5.4 mg/kg (1)	
Iron	TP-WS01	314 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17.
	TP-WS05	364 mg/kg (1)	
	RH-WS01	243 mg/kg (1)	
	RH-WS02	363 mg/kg (1)	
Lead	TP-WS01	91.2 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	296 mg/kg (1)	
	RH-WS01	71.4 mg/kg (1)	
	RH-WS02	13.8 mg/kg (1)	

Notes:

mg/kg milligrams per kilogram.
DL Detection limit.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 4 (Continued)

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Magnesium	TP-WS01	234 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	115 mg/kg (1)	
	RH-WS01	120 mg/kg (1)	
Manganese	TP-WS01	6.6 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	6.8 mg/kg (1)	
	RH-WS01	4.3 mg/kg (1)	
	RH-WS05	3.3 mg/L (1)	
Nickel	TP-WS01	1.4 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	1.8 mg/kg (1)	
	RH-WS01	1.8 mg/kg (1)	
	RH-WS05	1.3 mg/L (1)	
Selenium	TP-WS01	2.4 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	1.8 mg/kg (1)	
	RH-WS01	1.3 mg/kg (1)	
	RH-WS05	1.3 mg/L (1)	
Zinc	TP-WS01	408 mg/kg (1)	Ref. 3, pp. 45-47, 193; Ref. 4, pp. 25-26, 66 Ref. 24, p. 5; Ref. 26, pp. 1-5, 13-17
	TP-WS05	736 mg/kg (1)	
	RH-WS01	512 mg/kg (1)	
	RH-WS05	62.3 mg/L (1)	

Notes:

mg/kg milligrams per kilogram.
DL Detection limit.

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 4 is greater than 0, the hazardous substances presented in the previous table are available to the ground water pathway.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 4 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 lists the hazardous substances associated with Source 4. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substance associated with Source 4 potentially posing the greatest hazard is lead (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 4 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

Ten of the drums staged onsite were inventoried during the July 1998 Removal Assessment and the amount of material in each drum was estimated (Ref. 3, pp. 45-47, 194-196; Ref. 4, pp. 25-26). Based on these field measurements, the ten drums used to characterize this source contain a total of approximately 96 gallons of material. Therefore, this wastestream quantity will be used to evaluate the Hazardous Waste Quantity under Tier B according to the HRS Rule, Table 2-5 (Ref. 1, Sec. 2.4.2.1.3).

$$109 \text{ gallons} \times 10 \text{ pounds/gallon} = 1,090 \text{ pounds}$$

$$1,090 \text{ pounds} / 5,000 = 0.218$$

Wastestream Quantity of Source: 1,090 gallons
Wastestream Quantity Assigned Value: 0.218

2.4.2.1.3 Volume (Tier C) - Not Calculated

Volume (Tier C) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.4 Area (Tier D) - Not Calculated

Area (Tier D) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, hazardous wastestream quantity (Tier B) was the only tier evaluated for Source 4. Therefore, the hazardous wastestream quantity will be assigned as the source hazardous waste quantity value for Source 4 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 4 VALUES
A	NC
B	0.218
C	NC
D	NC

Source Hazardous Waste Quantity Factor Value: 0.218

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 5

Name and description of the source: API Separator

The API separator is located in the north central portion of the property. The API separator is constructed of concrete and is divided into 3 uncovered compartments. Sludge and soils removed from the used oils were placed in the API separator (Ref. 7, p. 3). Waste oils and sludges separated by the API separator were stored in a "slop-oil tank." Approximately 3 feet of oily liquid and sludge were observed in each of the three compartments in July 1998 (Ref. 7, p. 3). The ground surrounding the API separator was observed to be covered with a tar-like substance (Ref. 7, p. 3).

API separator sludge is a listed RCRA waste. Further, the sludges separated by the API separator are wastes, or a by-product, of the refining process. The sludges contained within the API separator are CERCLA eligible and available for evaluation under the HRS.

Location of the source with reference to a map of the site:

The API separator is located in the north central portion of the site (Ref. 3, p. 64). A Site Plan is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of an API separator and will be classified and evaluated as the HRS source type "container or tank."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: The API separator is constructed of concrete, but there is believed to be no liner associated with the API separator. Further, based on the available description of the API separator,

there is no maintained engineered cover or run-on control or runoff management system; however, this could not be verified based on the available information. According to information reviewed, petroleum-contaminated ground water was encountered by a construction crew near the northwestern portion of the site (Ref. 18, p. 1; Ref. 22, p. 18). The ground water encountered apparently had a strong gasoline odor (Ref. 22, p. 18). A sample was collected at the time of its discovery and consisted of approximately 50% water and 50% black, oily liquid (Ref. 18, p. 1). The source of contamination could not be determined but the presence of the petroleum contamination in the ground water may be an indication that there are no containment features associated with the API separator.

Because of the presence of petroleum contamination in the ground water, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: The ground surrounding the API separator is covered with a tar-like substance (Ref. 7, p. 3). Although an area of stained soil has been identified surrounding the API separator, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1,3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Thus, soil exposure was not scored as scoring the ground water pathway alone is sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

A total of three sludge samples (160330, 160331, and 160332) were collected from the API separator on 6 December 1995 by the TNRCC during a Compliance Evaluation Inspection. The three sludge samples were analyzed by Core Laboratories for VOCs, SVOCs, and total metals (Ref. 9, pp. 6-9, 27-38, 41-44)

SQLs were not calculated for these samples because the information necessary to perform the calculations were not provided in the laboratory analytical reports. QA/QC summary forms, result summaries, and chain of custody forms for these three samples are included as Reference 9.

In addition, one soil sample (S0-11) was collected from the stained soils surrounding the separator on 9 July 1998 during the Removal Assessment. The soil sample was analyzed by Specialized Assays, Inc. for the following constituents (Ref. 3, pp. 19, 182, 221):

- C VOCs
- C SVOCs
- C Pesticides/PCBs
- C Total Metals/Cyanide

SQLs were calculated for the soil sample and are provided as Reference 25. QA/QC summary forms, result summaries, and chain of custody forms for the soil sample is included as Reference 27.

As such, the constituents presented in the following table that were detected in the sludge and/or soil samples provide evidence of hazardous substances associated with Source 5. The location of the API separator is illustrated on Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 5

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Benzene	160330	12 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-30, 41-44
Ethylbenzene	160330	24 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-34, 41-44
	160331	1.1 mg/kg (0.625)	
Toluene	160330	86 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	4.4 mg/kg (0.625)	
	160332	1.3 mg/kg (0.625)	

Xylenes (total)	160330	130 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	6.6 mg/kg (0.625)	
	160332	2.7 mg/kg (0.625)	
1,2,4-Trimethylbenzene	160330	150 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	7.7 mg/kg (0.625)	
	160332	5.5 mg/kg (0.625)	
1,3,5-Trimethylbenzene	160330	180 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	9.5 mg/kg (0.625)	
	160332	5.9 mg/kg (0.625)	
Carbon Disulfide	160330	1.1 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-38, 41-44
2-Methylnaphthalene	160330	310 mg/kg (100)	Ref. 9, pp. 7-9, 27-30, 41-44
Naphthalene	160330	150 mg/kg (100)	Ref. 9, pp. 7-9, 27-30, 41-44
Tetrachloroethene	160330	4.5 mg/kg (0.625)	Ref. 9, pp. 7-9, 27-30, 41-44
Trichlorofluoromethane	160330	1,900 mg/kg (6.25)	Ref. 9, pp. 7-9, 27-30, 41-44
Arsenic	160330	5.74 mg/kg (2.105)	Ref. 9, pp. 7-9, 27-30, 41-44; Ref. 25, p. 1

Notes:

mg/kg milligrams per kilogram.
DL Detection limit.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 5 (Continued)

SUBSTANCE	SAMPLE ID	CONCENTRATION (SQL or DL)	REFERENCES
Barium	160330	12 mg/kg (5)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	10 mg/kg (5)	
	160332	9 mg/kg (5)	
Chromium	160330	7 mg/kg (0.05)	Ref. 3, pp. 19, 182, 221; Ref. 9, pp. 7-9, 27-30, 41-44; Ref. 25, p. 1; Ref. 27, pp. 51-56
	S0-11	23.8 mg/kg (2.105)	
Cobalt	S0-11	44.8 mg/kg (10.53)	Ref. 3, pp. 19, 182, 221; Ref. 25, p. 1; Ref. 27, pp. 51-56
Copper	S0-11	37.7 mg/kg (5.26)	Ref. 3, pp. 19, 182, 221; Ref. 25, p. 1; Ref. 27, pp. 51-56
Lead	160330	34 mg/kg (5)	Ref. 9, pp. 7-9, 27-38, 41-44
	160331	23 mg/kg (5)	
	160332	29 mg/kg (5)	
Selenium	S0-11	1.48 mg/kg (1.053)	Ref. 3, pp. 19, 182, 221; Ref. 25, p. 1; Ref. 27, pp. 51-56
Zinc	S0-11	143 mg/kg (4.211)	Ref. 3, pp. 19, 182, 221; Ref. 25, p. 1; Ref. 27, pp. 51-56

Notes:

mg/kg milligrams per kilogram.

SQL Sample Quantitation Limit; used for sample S0-11 (Ref. 25, p. 1; Ref. 27, pp. 51-56).

DL Detection Limit; used for samples 160330, 160331, and 160332 (Ref. 9, pp. 7-9).

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 5 is greater than 0, the hazardous substances presented in the previous table are available to the ground water pathway.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 5 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 lists the hazardous substances associated with Source 5. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substance associated with Source 5 potentially posing the greatest hazard is lead (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 5 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The API separator consists of three compartments measuring approximately 5 feet high by 5 feet wide by 5 feet deep. Approximately 3 feet of sludge and liquid material was measured in each of the three compartments during the March 1998 Site Inspection (Ref. 7, p. 3). Therefore, the wastestream quantity measured in the API separator will be used to evaluate the Hazardous Waste Quantity under Tier B according to the HRS Rule, Table 2-5 (Ref. 1, Sec. 2.4.2.1.3).

$$8.33 \text{ yd}^3 = 1,682.44 \text{ gallons}$$

$$1,682.44 \text{ gallons} \times 10 \text{ pounds/gallon} = 16,824.44 \text{ pounds}$$

16,824.44 pounds/5,000 = 3.36

Wastestream Quantity of Source: 1,682.44 gallons
Wastestream Quantity Assigned Value: 3.36

2.4.2.1.3 Volume (Tier C) - Not Calculated

Volume (Tier C) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.4 Area (Tier D) - Not Calculated

Area (Tier D) was not calculated because a wastestream quantity for the source has been calculated.

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, the hazardous wastestream quantity (Tier B) was the only tier evaluated for Source 5. Therefore, the hazardous wastestream quantity will be assigned as the source hazardous waste quantity value for Source 5 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 5 VALUES
A	NC
B	3.36
C	NC
D	NC

Source Hazardous Waste Quantity Factor Value: 3.36

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 6

Name and description of the source: Earthen Sump

The sump is an earthen sump located along the northern boundary of the site. There is no control equipment (berms, etc.) to prevent overflow or any record of the presence of a liner beneath the sump (Ref. 9, p. 4). The contents of the sump have apparently discharged onto the ground surface as evidenced by the presence of stained soils surrounding the sump (Ref. 22, p. 49).

Location of the source with reference to a map of the site:

The earthen sump is located along the northern boundary of the site (Ref. 3, p. 64). A Site Plan is included as Figure A-2 of Attachment A.

Source type for HRS evaluation purposes:

This source consists of an earthen sump and will be classified and evaluated as the HRS source type "surface impoundment."

Containment:

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: There is no record of the presence of a liner beneath the sump (Ref. 9, p. 4). A sample of the liquid contained in the sump was collected in December 1995. Various petroleum-related substances were identified in this sample but these compounds are not the same as those normally analyzed by the EPA. Various compounds, including benzene, ethylbenzene, isopropylbenzene, 2-methylnaphthalene, naphthalene, toluene, and xylenes have been identified in the shallow ground water beneath the site. Because of the presence of petroleum contamination in the shallow ground water, a containment factor value of 10 will be assigned to this source (Ref. 1, Table 3-2).

Release by overland flow migration and/or flood: The surface water migration pathway was not scored; therefore, surface water containment was not evaluated.

Release to soil: There is no control equipment to prevent overflow onto the ground surface from the sump (Ref. 9, p. 2). According to a site inspection performed by the TNRCC in December 1995, the contents of the earthen sump have discharged onto the ground (Ref. 22, p. 49). Even though there is no control equipment or containment features associated with the sump and the contents have reportedly discharged onto the ground surface, no schools or daycare facilities have been identified on or within 200 feet of any known source of contamination (Ref. 23, pp. 1, 3). Further, there are no workers currently present onsite as the site is inactive (Ref. 6, p. 10). Even though areas of soil contamination have been identified at the site, soil exposure was not scored as scoring the ground water pathway alone is sufficient to score the site.

2.2.2 Hazardous Substances Associated with a Source

One liquid sample (184402) and one sludge sample (184403) were collected from the earthen sump on 6 December 1995 by the TNRCC during the Compliance Evaluation Inspection. The samples collected from the sump were analyzed by Core Laboratories for VOCs, SVOCs, and total metals (Ref. 9, pp. 6-9, 21-26).

SQLs were not calculated for these samples as the information necessary to perform the calculations was not provided in the laboratory analytical reports. Therefore, the detection limits will be used in the place of the SQLs per HRS Rule Section 2.3 (Ref. 1, Sec. 2.3). QA/QC summary forms, result summaries, and chain of custody forms for these two samples are included as Reference 9.

As such, the constituents presented in the following table provide evidence of hazardous substances associated with Source 6. The location of the earthen sump is illustrated on Figure A-2 of Attachment A.

HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 6

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL)	REFERENCES
Barium	184402	0.07 mg/L (0.05)	Ref. 9, pp. 6-9, 21-26, 45-54
	184403	32 mg/kg (5)	
Chromium	184403	8 mg/kg (5)	Ref. 9, pp. 6-9, 25-26, 50-54
Lead	184403	40 mg/kg (5)	Ref. 9, pp. 6-9, 25-26, 50-54

Notes:

mg/L milligrams per liter.
mg/kg milligrams per kilogram.
DL Detection limit.

2.2.3 Identify Hazardous Substances Available to a Pathway

Because containment for Source 6 is greater than 0, the following hazardous substances are available to the ground water pathway: barium, lead, and chromium.

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1 of this documentation record for specific information related to samples that meet the criteria for an observed release to the ground water migration pathway.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 6 are presented in the following subsections below.

2.4.1 Selection of Substance Potentially Posing Greatest Hazard

The table presented in Section 2.2.2 lists the hazardous substances associated with Source 6. The substance(s) selected as potentially posing the greatest hazard for the pathway (threat) will be used in evaluating the waste characteristic category of the pathway (threat) (Ref. 1, Sec. 2.4.1). The substance associated with Source 6 potentially posing the greatest hazard is lead (refer to Section 3.2 of this document).

2.4.2 Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A) - Not Calculated

The hazardous constituent quantity is not available; therefore, it is not possible to adequately determine a hazardous constituent quantity (Tier A) for Source 6 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The hazardous wastestream quantity is not available; therefore, it is not possible to adequately determine a hazardous wastestream quantity (Tier B) for Source 6 (Ref. 1, Sec. 2.4.2.1.1). As a result, the evaluation of hazardous waste quantity proceeds to the evaluation of Tier C, volume (Ref. 1, Sec. 2.4.2.1.2).

2.4.2.1.3 Volume (Tier C) - Not Calculated

The information available is not sufficient to evaluate the identified surface impoundment volumes under Tier C, as required in Section 2.4.2.1.3 of the HRS Rule. As a result, the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier D, area (Ref. 1, Sec. 2.4.2.1.3).

2.4.2.1.4 Area (Tier D) - Not Calculated

The area of the earthen sump was measured at approximately 20 feet x 15 feet resulting in a coverage of 300 ft². The evaluation of Hazardous Waste Quantity will therefore be conducted under Tier D, area (Ref. 1, Sec. 2.4.2.1.4).

$$\text{Area} = 20 \text{ feet} \times 15 \text{ feet} = 300 \text{ ft}^2$$

The equation for assigning Area (Tier D) a Hazardous Waste Quantity Value from Table 2-5 is $A^1/13$. Where $A^1 (\text{Source}) / 13 = \text{Hazardous Waste Quantity Value}$.

$$300 \text{ ft}^2 / 13 = 23.077$$

2.4.2.1.5 Source Hazardous Waste Quantity Value

According to the HRS Rule, the highest of the values assigned to each source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D) should be assigned as the source hazardous waste quantity value. As such, area (Tier D) was the only tier evaluated for Source 6. Therefore, the area will be assigned as the source hazardous waste quantity value for Source 6 (Ref. 1, Sec. 2.4.2.1.5).

TIER EVALUATED	SOURCE 6 VALUES
A	NC
B	NC
C	NC
D	23.077

Source Hazardous Waste Quantity Factor Value: 23.077

2.4.2.2 Calculation of Hazardous Waste Quantity Factor Value

The sum of the source hazardous waste quantity values assigned to all sources for the pathway being evaluated is used to select a factor value from HRS Table 2-6 as the hazardous waste quantity factor value (Ref. 1, Sec. 2.4.2.2).

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source	Source Hazardous Waste Quantity Value	Containment				
		Ground Water	Surface Water	Soil Exposure	Gas	Particulate
1	80	10	NE	NE	NE	NE
2	0.948	10	NE	NE	NE	NE
3	1.42	10	NE	NE	NE	NE
4	0.218	10	NE	NE	NE	NE
5	3.36	10	NE	NE	NE	NE
6	23.077	10	NE	NE	NE	NE

Note:

NE Not Evaluated.

The sum of the Source Hazardous Waste Quantity Values for R&H Oil Company, rounded to the nearest integer is 109 (Ref. 1, Sec. 2.4.2.2). The Hazardous Waste Quantity Factor Value assigned to this sum is 100 (Ref. 1, Table 2-6).

Hazardous Waste Quantity Factor Value: 100

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 General Considerations

Location and Physiographic Setting

The San Antonio area lies within two physiographic provinces: the Edwards Plateau and the Gulf Coastal Plain (Ref. 28, p. 7). The Edwards Plateau is an extensive uplands area that ranges in altitude from about 1,500 feet to more than 2,300 feet above sea level. It consists of two sub-areas; a limestone-capped high plateau of low local relief and a lower dissected plateau of moderate relief that is underlain mostly by marl, shale, and limestone. The high plateau is serrated along its margins by re-entrant valleys cut by headward-eroding streams. Caves occur along escarpments (Ref. 28, p. 7). The Gulf Coastal Plain is a gently gulfward-sloping plain of low to moderate relief and is underlain by sands and clays of Tertiary age (Ref. 28, p. 7).

These two physiographic provinces are separated from each other by the Balcones escarpment which extends southwestward from Williamson County to San Antonio, and then westward (Ref. 29, p. 2). The Balcones escarpment is the topographic expression of the Balcones fault and separates the Edwards Plateau from the Gulf Coastal Plain (Ref. 28, p. 7). The Balcones fault zone occurs in northern Bexar County, far north of the site (Ref. 43, pp. 1, 3). The Balcones fault zone does not create an aquifer discontinuity since it is too far north of the site, which is located in southern Bexar county (Ref. 43, p. 3).

Caves and sinkholes are common, and indicative of karst, where limestone of Cretaceous age is exposed in the area immediately north of the Balcones escarpment, such as in northern Bexar County. Existing sinkholes probably are interconnected by solution channels formed by the ancestral drainage system (Ref. 28, p. 7).

Regional Geology

Sedimentary and crystalline rocks that range in age from Precambrian to Holocene underlie south central Texas. These rocks are subdivided, for the purpose of this discussion, into three groups: (1) rocks of Precambrian age, (2) formations of Paleozoic age, and (3) formations of Mesozoic and Cenozoic age (Ref. 28, p. 8). Rocks of Precambrian age are not exposed in the San Antonio area (Ref. 28, p. 8).

The Paleozoic formations consist of hundreds of feet of sandstone, dolomite, limestone, siltstone, shale, and metamorphic rocks. In the San Antonio area, the Paleozoic rocks are present at depths of about 5,000 to 8,000 feet (Ref. 28, p. 8).

Formations of Mesozoic and Cenozoic age are extensively exposed in the San Antonio area and these formations exhibit various depositional facies. The Mesozoic rocks contain near-shore facies, consisting of sediments deposited on tidal flats and sabkhas, and of offshore carbonate sediments that accumulated on a

carbonate platform. The upper Cretaceous formations reflect more uniform depositional conditions when the seas inundated a vast region of the continental interior. Over most of the area, thick beds of deep-water marine clay and carbonate rocks were deposited. In addition, volcanic ash and bentonite commonly are present in the upper Cretaceous rock sequence. The Mesozoic sedimentary rocks are intruded by igneous rock, mainly basalt, which commonly is altered to serpentine (Ref. 28, p. 9).

The Cenozoic deposits consist mostly of clastic sediments that accumulated near the shoreline of regressing continental seas. The deposits are mostly in the Gulf Coastal Plain and are derived from the erosion of the Edwards Plateau. These deposits are cut by major faults that extend into the underlying Mesozoic rocks (Ref. 28, p. 9).

Late Cenozoic deposits consist of large alluvial fans that extend from the Balcones escarpment across the Balcones fault zone and into the Gulf Coastal Plain. These alluvial fans and associated terrace deposits are the results of intermittent uplifts of the Edwards Plateau. During and following an uplift, erosion occurred, and gravel and coarse sand were deposited by streams emerging from the Edwards Plateau and spreading out onto the Gulf Coastal Plain (Ref. 28, p. 9).

Regional Hydrogeology

An aquifer is defined as one or more strata of rock or sediment that is saturated and sufficiently permeable to yield economically significant quantities of water to wells or springs. An aquifer includes any geologic material that is currently used or could be used as a source of water (for drinking or other purposes) within a specified Target Distance Limit (TDL) (Ref. 30, p. 4). As such, the Edwards aquifer is considered to be an HRS-eligible aquifer and will be used to evaluate the R&H Oil Company site.

The Edwards aquifer is one of the most permeable and productive carbonate aquifers in the United States and has been designated as a "sole source" water supply for the City of San Antonio (Ref. 28, p. 6). The aquifer covers approximately 4,350 square miles (Ref. 43, p. 1). The Edwards aquifer supplies water to the irrigation, military, and industrial establishments of practically all the area (Ref. 31, p. 8).

The aquifer, composed predominantly of limestone formed during the early Cretaceous, exists under artesian conditions (confined) within the San Antonio area (Ref. 46, p. 1). The Edwards aquifer consists of the Georgetown Limestone and formations of the Edwards Group (the primary water-bearing unit). Thickness of the Edwards Group can be up to 600 feet (Ref. 32, p. 9; Ref. 43, p. 1). The Edwards aquifer in south-central Texas is an example of karst terrain where the limestones and dolomites are exposed at land surface (Ref. 47, p. 1). Further, the entire Edwards aquifer is a karst aquifer (Ref. 46, p. 1).

The large porosity and exceptional permeability of the unconfined part of the Edwards aquifer result from the dissolution of limestone by circulating ground water and development of a cavernous network along fractures (Ref. 28, p. 5). This dissolution of the formation by natural waters over time is indicative of a karst aquifer. Karst terrain is characteristic of regions that are underlain by limestone and dolomite bedrock. Because of

the dissolution cavities and the channels that comprise them, karst aquifers are considered extremely vulnerable to contamination. The movement of hazardous substances released into karst aquifers is highly unpredictable, and transport over relatively long distances can occur very rapidly (Ref. 30, p. 5).

Recharge to the aquifer occurs primarily by the downward percolation of surface water from streams draining off the Edwards Plateau to the north and west by direct infiltration of precipitation on the outcrop (Ref. 43, p. 1). This recharge reaches the aquifer through crevices, faults, and sinkholes (Ref. 43, p. 1). Numerous solution cavities along vertical joints and sinkholes provide an efficient link between the land surface and the water table (Ref. 47, p. 1). Water entering the Edwards aquifer in the recharge area moves generally in a southeasterly direction from the unconfined to the confined parts of the aquifer (Ref. 28, p. 11).

Ground water moving through the aquifer has dissolved large amounts of rock to create highly permeable solution zones and channels that facilitates rapid flow and relatively high storage capacity within the aquifer. Highly fractured strata in fault zones have also been preferentially dissolved to form conduits capable of transmitting large amounts of water.

Due to its extensive honeycombed and cavernous character, the Edwards aquifer yields moderate to large quantities of water (Ref. 43, p. 1). Thousands of wells tap the Edwards aquifer. The greatest density of wells is in Uvalde and Bexar counties. The annual number of new wells constructed is increasing because additional land is being irrigated and the population is growing in Bexar County. Pumpage is concentrated in the confined part of the Edwards aquifer, with the largest withdrawals in and around San Antonio (Ref. 28, p. 14).

Many of the wells in the freshwater zone of the confined aquifer can yield more than 1,000 gallons per minute. Yields of wells generally are limited more by the capacity of the pumps to discharge water than by the ability of the aquifer to provide water to the well. Well depths range from less than 500 feet in the unconfined area to more than 3,000 feet (Ref. 28, p. 14).

Site Geology

The local geological information was obtained from well logs completed for the state of Texas on the Kelly Air Force Base, west of the R&H Oil Property (Refs. 23; 49, pp. 2-4.). The local geology in the vicinity of the site is consistent with the regional geology based on a review of the geological information provided in the completed well log for Kelly Air Force Base. (Refs. 33; 49, pp. 2-3). Based on this well log, the local geology can be described as follows (Ref. 49, pp. 2-3):

LAYER	COMPOSITION	LOCATION (Feet below ground surface)	REFERENCE
Alluvium	top soil	0 - 2	Ref. 49, pp. 2-4
	clay, sand, and gravel	2 - 40	Ref. 49, pp. 2-4

Midway Group	yellow clay, sand	40 - 91	Ref. 49, pp. 2-4
	sand	91 - 122	Ref. 49, pp. 2-4
Navarro Group	yellow clay, sand	122 - 160	Ref. 49, pp. 2-4
	sandy shale	160 - 250	Ref. 49, pp. 2-4
	sand	250 - 370	Ref. 49, pp. 2-4
	sandy shale	370 - 474	Ref. 49, pp. 2-4
	sand	474 - 489	Ref. 49, pp. 2-4
Taylor Group	rock	489 - 492	Ref. 49, pp. 2-4
	brown shale	492 - 594	Ref. 49, pp. 2-4
	sandy shale	594 - 620	Ref. 49, pp. 2-4
Anacacho Limestone	argillaceous limestone and marl	620 - 740	Ref. 49, pp. 2-4
Brown Shale	brown shale	740 - 778	Ref. 49, pp. 2-4
Austin Chalk	argillaceous limestone	778 - 924	Ref. 49, pp. 2-4
Eagleford Shale	sandy shale	924 - 954	Ref. 49, pp. 2-4
Buda Limestone	fine grained, dense, hard, limestone	954 - 1015	Ref. 49, pp. 2-4
Del Rio Clay	clay	1015 - 1068	Ref. 49, pp. 2-4
Georgetown Member	limestone	1068 - 1090	Ref. 49, pp. 2-4
Edwards Limestone	fractured limestone	1090 - 1500	Ref. 49, pp. 2-4

The site is immediately underlain by unconsolidated alluvium consisting of clay, silt, gravel, and caliche. The upper 10 feet of the alluvium is primarily a tight impermeable clay, grading downward into 20 or more feet of coarse sands and gravels. The overall thickness of the alluvium is variable, but has a total thickness of approximately 40 feet in the vicinity of the site (Ref. 49, p. 2).

The Navarro Group and Taylor Group underlie the alluvium. The Navarro Group is composed of marl, clay, sandstone, and siltstone (Ref. 33, p. 6). Within the vicinity of the site, the Navarro Group has an approximate thickness of 367 feet (Ref. 49, pp. 2-3). The Taylor Group is dominantly a greenish gray to brownish gray clay and has an approximate thickness of 131 feet within the vicinity of the site (Ref. 49, p. 2).

The Anacacho Limestone is composed of marl and limestone that is light yellow to yellow-brown and light-grey in color (Ref. 33, p. 6). Locally, this formation is fossiliferous (Ref. 22, p. 6). The Anacacho Limestone was measured to have an approximate thickness of 120 feet in the vicinity of the site (Ref. 49, pp. 2-3). Directly underneath the Anacacho Limestone is Brown Shale at a thickness of 38 feet in the vicinity of the site (Ref. 49, pp. 2-3).

The Austin Chalk is a Cretaceous-aged carbonate mudstone and is composed of chalk and marl that is greenish white to white in color. Locally, this formation is highly fossiliferous (Ref. 33, p. 6). The Austin Chalk was measured to have an approximate thickness of 146 feet within the vicinity of the site (Ref. 49, pp. 2-3).

The Eagleford Shale is a Cretaceous-aged shale, siltstone, and limestone formation. The upper part of the formation is composed of limestone and shale that is light yellow to brown in color. The lower part of the formation is composed of siltstone and a very fine-grained sandstone that is yellow to gray in color (Ref. 33, p. 6). The Eagleford Group was measured to have an approximate thickness of 30 feet within the vicinity of the site (Ref. 49, pp. 2-3).

The Buda Limestone is a Cretaceous-aged fine-grained, hard, massive limestone. It is light gray to pale orange in color (Ref. 33, p. 6). The Buda Limestone was measured to have an approximate thickness of 61 feet within the vicinity of the site (Ref. 49, pp. 2-3).

The Del Rio Clay is a calcareous and gypsiferous clay that is light gray to yellowish gray in color and acts as a confining unit to the Edwards aquifer (Ref. 33, p. 6). The Del Rio Clay was measured to have an approximate thickness of 53 feet within the vicinity of the site (Ref. 49, pp. 2-3).

The Georgetown and Edwards Limestone are a carbonate rock unit that is composed of limestone and dolostone that weathers generally to form a honeycombed rock (Ref. 29, p. 5). Sinkholes are common in areas (Ref. 29, p. 5). In its unaltered state, most of the Edwards Limestone is a dense, hard limestone. Karst terrain is characteristic of regions that are underlain by limestone and dolomite (dolostone) bedrock. In many areas, the carbonate bedrock is present at the land surface as exemplified by the Edwards aquifer where the karst terrain is exposed at the surface (Ref. 47, p. 1).

Site Hydrogeology

Beneath the site, the alluvial deposits form a shallow alluvial aquifer. The ground water flow direction of the alluvial aquifer is towards the southeast. Depth to water has been measured at approximately 10 to 15 feet below ground surface (Ref. 8, pp. 26-21).

The alluvial aquifer is underlain by the lower confining unit of the Del Rio Clay (Ref. 32, p. 9). The Del Rio Clay is essentially a non water-bearing clay unit between the shallow alluvial aquifer and the Edwards aquifer (Ref. 22, p. 84). Based on a registered well log completed for a BMWD municipal supply well located within a 1-mile radius of the site, the Del Rio Clay has an approximate thickness of 53 feet within the vicinity of the site (Ref. 49, pp. 2-4).

The Del Rio Clay is underlain by the Edwards aquifer. The Edwards aquifer is a confined aquifer beneath the site (Ref. 46, p. 1). In addition, the entire Edwards aquifer is considered a karst aquifer (Ref. 46, p. 1; Ref. 48, p. 1). San Antonio, which obtains its entire municipal water supply from the Edwards aquifer, is one of the largest cities in the world to rely solely on a single ground water source (Ref. 43, p. 1). Approximately

54 percent of the water pumped from the Edwards aquifer by the City of San Antonio is used for municipal supply (Ref. 43, p. 1).

3.1 **LIKELIHOOD OF RELEASE**

3.1.1 **Observed Release**

The ground water migration pathway is the only pathway being scored for the R&H Oil Company site due to the nature of the contamination (i.e., ground water plume) (Ref. 1, Sec. 2.2.3). The shallow alluvial aquifer will be evaluated because an observed release to this aquifer can be documented. Information used to evaluate and score the ground water migration pathway is presented in the subsections below.

Aquifer Evaluated: Shallow Alluvial Aquifer

Identification and characterization of the ground water plume was based on ground water sampling results from monitoring wells completed within the shallow alluvial aquifer. Ground water samples were collected from ten (10) monitoring wells completed within the shallow alluvial aquifer. Four of the monitoring wells are located in the southern portion of the site. The remaining six monitoring wells were installed off site (Ref. 22, p. 89). An observed release to the ground water pathway, as defined in Section 3.1.1 of the HRS Rule, has been established based on the analytical results from these ground water samples (Ref. 1, Sec. 2.3).

Direct Observation: Not Applicable

Chemical Analysis:

Background Wells

Three ground water samples were collected from monitoring wells and used to characterize the background conditions of the shallow alluvial aquifer. The ground water samples, RHGW-01 through RHGW-03, were collected on 8 July 1998 during the Removal Assessment. The ground water samples were collected from monitoring wells located northeast and northwest of the site at East Kelly AFB. RHGW-01 and RHGW-03 were collected from monitoring wells located northwest of the site on East Kelly AFB. RHGW-02 was collected from a monitoring well located on Humboldt Street, which is northeast of the site (Ref. 3, pp. 5-6, 178-180, 229, 231).

The direction of ground water flow within the alluvial aquifer is towards the southeast based on a ground water investigation conducted in April 1990 (Ref. 8, pp. 5, 15). Thus, ground water wells chosen to represent background conditions of the shallow alluvial aquifer were selected because of their location being upgradient or cross-gradient of the contaminated wells. The monitoring wells used to represent background conditions of the shallow alluvial aquifer are completed at depths ranging from 30 feet to 59 feet below ground surface (Ref. 35, pp. 1-16).

The samples were analyzed by Specialized Assays, Inc. for VOCs, SVOCs, pesticides, PCBs, total metals, and cyanide (Ref. 36, pp. 1-6). Because these samples were not analyzed through the USEPA CLP and

several chlorinated solvents and metals were detected in the background samples, an observed release will be established when the sample measurement is three times or more above the background concentration for these substances. For substances that were not detected in the background samples, an observed release will be established when the sample measurement exceeds the laboratory detection limit (Ref. 1, Sec. 2.3, Table 2-3).

Analytical results for the three background samples collected from the shallow alluvial aquifer are presented in the following table. Monitoring wells designated as background wells are depicted on Figure A-6 of Attachment A of this documentation record.

GROUND WATER BACKGROUND SAMPLE RESULTS

SAMPLE LOCATION	MW-197	MW-199	MW-125	BACKGROUND
TYPE OF WELL SAMPLE ID DATE SAMPLED TOTAL DEPTH SCREENED INTERVAL	MONITORING RHGW-01 07/08/98 30 FT 23 - 30 FT	MONITORING RHGW-02 07/08/98 59 FT 34.5 - 51.5 FT	MONITORING RHGW-03 07/08/98 46 FT 28.5 - 44 FT	3 x MAXIMUM BACKGROUND
Hazardous Substance	Concentration in ug/L (SQL or CRQL/CRDL)			
Benzene	ND (2)	ND (2)	ND (2)	ND (2)
Ethylbenzene	ND (2)	ND (2)	ND (2)	ND (2)
Isopropylbenzene	ND (2)	ND (2)	ND (2)	ND (2)
2-Methylnaphthalene	ND (11.1)	ND (11.6)	ND (10)	ND (11.6)
Naphthalene	ND (2)	ND (2)	ND (2)	ND (2)
Toluene	ND (2)	ND (2)	ND (2)	ND (2)
Xylenes (total)	ND (2)	ND (2)	ND (2)	ND (2)
Arsenic	ND (5)	ND (5)	ND (5)	ND (5)
Barium	129 (10)	77 (10)	105 (10)	387
Manganese	39 (15)	ND (15)	29 (15)	117
Zinc	22 (20)	ND (20)	ND (20)	66
References	Ref. 3, pp. 5-6, 178-180, 229; Ref. 36, pp. 1-6	Ref. 3, pp. 5-6, 178-180, 229; Ref. 36, pp. 7-12	Ref. 3, pp. 5-6, 178-180, 231; Ref. 36, pp. 13-18	Ref. 1, Sec. 2.3

Notes:

ug/L micrograms per liter.
 SQL Sample quantitation limit.
 CRQL Contract-required quantitation limit.
 CRDL Contract-required detection limit.

RELEASE WELL SAMPLE RESULTS

Phase II Remedial Investigation

A Phase II Remedial Investigation was conducted at the site by Raba-Kistner Consultants, Inc. as a result of a spill of 8,000 gallons of premium-grade ethanol blended gasoline. The Phase II Remedial Investigation was conducted on 18 and 19 April 1990 (Ref. 8, p. 4). A total of eight soil borings were advanced at the site. The soil borings were advanced to a maximum depth of 54.5 feet below ground surface. Six of the soil borings were converted to monitoring wells, MW-1 through MW-6, completed within the shallow alluvial aquifer (Ref. 8, p. 4).

Ground water samples were collected from each of these six monitoring wells and submitted to the Raba-Kistner Consultants, Inc. laboratory for analysis. Ground water samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX); total petroleum hydrocarbons (TPH), and total lead. Analytical results indicated the presence of light to mid-range hydrocarbons. Hydrocarbon free-product was encountered during drilling activities, but was not detected as a free-phase floating product in any of the monitoring wells after their completion and development (Ref. 8, pp. 6-7).

Because background samples were not collected as part of this investigation and the background samples collected in July 1998 as part of the Removal Assessment activities are not appropriate for comparative purposes, the analytical results from this investigation have only been presented to document the presence of contamination in the ground water beneath the site. Monitoring well locations are depicted on Figure A-7 of Attachment A.

PHASE II REMEDIAL INVESTIGATION GROUND WATER RESULTS

SAMPLE LOCATION	MW-3	MW-4	MW-5	MW-6
TYPE OF WELL	MONITORING	MONITORING	MONITORING	MONITORING
SAMPLE ID	6-1956-1	6-1956-2	6-1987-1	6-1987-2
DATE SAMPLED	01/29/91	01/29/91	02/05/91	02/05/91
TOTAL DEPTH	48 FT	44 FT	43 FT	54.5 FT
SCREENED INTERVAL	10 - 48 FT	9 - 44 FT	6 - 43 FT	10 - 54.5 FT
Hazardous Substance	Concentration in mg/L (MDL)			
Benzene	2.6 (0.005)	0.7 (0.005)	2 (0.005)	0.29 (0.005)
Toluene	7.3 (0.005)	0.06 (0.005)	0.008 (0.005)	2 (0.005)
Ethylbenzene	0.7 (0.005)	0.05 (0.005)	0.02 (0.005)	0.14 (0.005)
Xylenes (total)	6.6 (0.005)	0.23 (0.005)	0.03 (0.005)	1.6 (0.005)
TPH	5 (1)	ND (1)	4 (1)	6 (10)
References	Ref. 8, pp. 14, 18, 28	Ref. 8, pp. 14, 19, 28	Ref. 8, pp. 14, 20, 28	Ref. 8, pp. 14, 21, 28

Notes:

MDL Method detection limit.
 mg/L milligrams per liter.

Removal Assessment

A total of nine ground water samples were collected from monitoring wells located at and surrounding the site in July 1998 during the Removal Assessment activities. All of the monitoring wells are completed within the shallow alluvial aquifer. The monitoring wells are completed at depths ranging from 37 feet to 66 feet below ground surface within the shallow alluvial aquifer (Ref. 8, pp. 16-22).

Sample RHGW-04 and sample RHGW-07 (a duplicate) were collected from a monitoring well that is located in a residential area southeast of the site. Sample RHGW-05 was collected from a monitoring well located south of the site. Sample RHGW-06 was collected from a monitoring well located in a residential area east of the site (Ref. 3, pp. 4-5, 178-180, 233, 237). Samples TPGW-01 through TPGW-05 were collected from monitoring wells located onsite (Ref. 4, pp. 4-5, 55-57).

The samples were analyzed by Specialized Assays, Inc. for VOCs, SVOCs, pesticides, PCBs, total metals, and cyanide (Ref. 3, pp. 233, 277; Ref. 36, pp. 1-6). Based on the analytical data, the samples collected from background purposes during this same investigation were collected and analyzed in the same manner as the samples collected to establish an observed release. The release samples were compared to the most appropriate background samples based on the date sampled and the screened interval of the well. The extent of the ground water plume was defined by ground water samples meeting observed release criteria per HRS Rule, Section 3.1.1. Well locations are depicted on Figure A-6 of Attachment A.

GROUND WATER RELEASE SAMPLES

SAMPLE LOCATION	BACKGROUND	MW-200	MW-200	MW-184	MW-210
TYPE OF WELL SAMPLE ID DATE SAMPLED TOTAL DEPTH SCREEN INTERVAL	3 x MAXIMUM BACKGROUND	MONITORING RHGW-04 07/08/98 48.5 FT 31 - 46 FT	MONITORING RHGW-07 07/08/98 48.5 FT 31 - 46 FT	MONITORING RHGW-05 07/08/98 37 FT 19.2 - 34.2 FT	MONITORING RHGW-06 07/08/98 66 FT 23 - 38 FT
Hazardous Substance	Concentration in ug/L				
Manganese	117	62	70	522	51
References	Ref. 1, Sec. 2.3	Ref. 3, pp. 4-6, 178-180, 233; Ref. 36, pp. 19-24	Ref. 3, pp. 4-6, 178-180, 233; Ref. 36, pp. 37-42	Ref. 3, pp. 4-6, 178-180, 237; Ref. 36, pp. 25-30	Ref. 3, pp. 4-6, 178-180, 237; Ref. 36, pp. 31-36

Note:

ug/L micrograms per liter.

GROUND WATER RELEASE SAMPLES (Continued)

SAMPLE LOCATION	BACKGROUND	MW-01	MW-02	MW-03	MW-04	MW-05
TYPE OF WELL SAMPLE ID DATE SAMPLED TOTAL DEPTH SCREEN	3 x MAXIMUM BACKGROUND	MNTR. TPGW-01 07/08/98 40 FT 10 - 40 FT	MNTR. TPGW-02 07/08/98 42 FT 10 - 42 FT	MNTR. TPGW-03 07/08/98 48 FT 10 - 48 FT	MNTR. TPGW-04 07/08/98 44 FT 9 - 44 FT	MNTR. TPGW-05 07/08/98 44 FT 9 - 44 FT
Hazardous Substance	Concentration in ug/L					
Benzene	ND	1,970	782	163	369	408
Ethylbenzene	ND	83.5	44.3	ND	ND	ND
Isopropylbenzene	ND	93.9	45	2.6	10.8	12.3
2-Methylnaphthalene	ND	93.7	12.1	ND	98.4	85.7
Naphthalene	ND	190 J/2.5 = 76*	36.1 J/2.5 = 14.44*	ND	ND	ND
Toluene	ND	17	7.5	2.8	2.1	4.3
Xylenes (total)	ND	19.8	15.7	2.5	2.7	3.4
Arsenic	ND	73	557	61	111	108
Barium	387	537	152	372	305	297
Manganese	117	372	744	513	607	590
Zinc	66	ND	ND	112	ND	ND
References	Ref. 1, Sec. 2.3	Ref. 4, pp. 4-5, 55-57; Ref. 8, pp. 14, 16; Ref. 37, pp. 1-6	Ref. 4, pp. 4-5, 55-57; Ref. 8, pp. 14, 17; Ref. 37, pp. 7-12	Ref. 4, pp. 4-5, 55-57; Ref. 8, pp. 14, 19; Ref. 37, pp. 13-18	Ref. 4, pp. 4-5, 55-57; Ref. 8, pp. 14, 20; Ref. 37, pp. 19-24	Ref. 4, pp. 4-5, 55-57; Ref. 8, pp. 14, 21; Ref. 37, pp. 25-30

Notes:

ug/L micrograms per liter.

* According to guidance promulgated in the document "Using Qualified Data to Document an Observed Release" sample measurements of release samples that are "J" qualified and having an unknown bias are useable to document an observed release after dividing the sample measurement by the appropriate CARD factor (Ref. 38, pp. 4, 10).

Attribution

The site is an abandoned oil refinery and gasoline blending facility. The refinery was a crude oil refinery and used oil facility that operated under many different oil/processing companies. The most recent activities at the site involved oil refining and used oil storage.

Because the site was a former refinery, some contaminants associated with certain sources may be related to petroleum product releases and may not be eligible for evaluation under CERCLA due to petroleum exclusion contained in the law's definition of hazardous waste. However, certain petroleum refining wastes are defined as RCRA wastes in 40 CFR 261.131 and are, therefore, not excluded. These RCRA wastes include, but are not limited to, API separator sludge, leaded tank bottoms, refinery primary oil/water/solid separation sludge, and refinery secondary (emulsified) oil/water/solid separation sludge.

The U.S. petroleum refining industry consists of approximately 180 facilities that manufacture a wide variety of fuel and lubrication products and petrochemical feedstocks. The simplest refineries use distillation to separate gasoline or lube oil fractions from crude, leaving the further refining of their residuum to other refineries or for use in asphalt (Ref. 44, p. 10).

Common residuals, or by-products, of the refining process include crude oil tank sediments, residual oil tank sediment or sludge, and unleaded gasoline tank sediment (Ref. 44, p. 16). Crude oil tank sediments are emulsions that form from solid particles, heavy oil, and water that settle to the bottom of tanks over time. Hazardous constituents potentially present in crude oil tank sediments are identical to those found in crude oil and include benzene, toluene, ethylbenzene, and xylene (BTEX), sulfur, polynuclear aromatic hydrocarbons (PAHs), and metals (Ref. 44, p. 16).

Polynuclear aromatic hydrocarbons, or PAHs, are substances commonly associated with petroleum refining. PAHs are generated and released from the incomplete combustion of organic materials. They occur naturally within the environment, but are also artificially produced. Petroleum-related activities are reported to account for over 70 percent of the artificially generated source (Ref. 45, p. 3). The most common PAHs include: naphthalene, acenaphthene, dibenzofuran, phenanthrene, anthracene, fluoranthene, pyrene, benzo(b)fluoranthene, chrysene, and pyrene (Ref. 45, p. 4).

Residual oil is generally considered to be equivalent to fuel oil and is typically produced from units such as atmospheric and vacuum distillation, hydrocracking, delayed coking, and visbreaking. Residual oil tank sediment (or sludge) consists of heavy hydrocarbons, rust, and scale from process pipes and reactors, and entrapped oil that settles to the bottom of the tank. Hazardous constituents potentially present in residual oil tank sludge are similar to those found in crude oil tank sludge and include BTEX, sulfur, PAHs, and metals (Ref. 44, p. 18).

Unleaded gasoline tank bottoms, sediments, or sludge are unlike the heavy hydrocarbon sludges that typify crude oil tank sediments. Rather, small amounts of rust and scale are removed from the tank bottom.

Hazardous constituents present in gasoline will also be present in the tank bottoms and include BTEX (Ref. 44, p. 17).

Sources identified at the R&H site have been found to contain residual waste oils, residual tank sediments and sludges, and soils contaminated by these waste oils and sludges. Because the wastes remaining on site are residual waste oils and residual tank sediments and sludges, which are by-products of the refining process, they are considered CERCLA eligible.

Specific sources of CERCLA-eligible hazardous substances identified at the site have been described previously within this documentation record. The sources at the site have been found to contain hazardous substances commonly associated with petroleum refining, including: BTEX, PAHs, and metals. BTEX, PAHs, and metals have also been detected in the shallow ground water beneath the site.

The Monarch Refining Company operated the first refinery at the site from December 1950 through October 1974. The refinery produced hydrocarbon products including gasoline, fuel oils, and ink oil (Ref. 4, pp. 67-74).

The Flint Chemical Company purchased the property from the Monarch Refining Company in October 1974. The Flint Chemical Company continued to operate a refinery on the property and continued to produce large quantities of hydrocarbon products until April 1978 (Ref. 4, pp. 71-72; Ref. 11, p. 1).

In September 1987, the Flint Chemical Company sold several parcels of the property to Golden Materials and Supply, Inc. who utilized the property to reprocess used oils from various generators (Ref. 13, pp. 1-15). Primarily, the used oils were composed of automotive oils, lubricating oils, hydraulic oils, transmission oils, cooling oils, and heavy equipment oils (Ref. 10, p. 1).

Incoming oils received by Golden Materials and Supply, Inc. were stored at the site in four 10,000-gallon ASTs prior to being processed and blended. Used oils were processed in a centrifuge to remove any sludge or solids, which were sent to the API separator. Waste oils separated from the sludge and solids were then stored in an AST for further reprocessing or disposal. The used oils removed during the centrifuge process were subsequently sent to a distillation unit to remove any water. Volatile organics separated at this stage were then condensed and stored in two ASTs prior to blending with other used oils (Ref. 10, p. 1).

Structures remaining onsite include a boiler room, a process area, ASTs and associated piping, an API separator, an earthen sump, and numerous 55-gallon drums (Ref. 3, pp. 4, 64; Ref. 4, p. 4). There are approximately 40 ASTs located on the property and their capacities range from 5,000 gallons to over 400,000 gallons. The contents and condition of each of the ASTs is not known; however, some of the ASTs appeared to be leaking onto the ground (Ref. 7, p. 3). A black tar-like material has been observed on the ground surface surrounding some of the ASTs. In addition, there are various piping configurations associated with the ASTs leading to and from the process area. Oily liquids beneath the piping has been observed in various locations around the site (Ref. 7, p. 4).

There is an API separator located in the north central portion of the site. Sludge and soils removed from the used oils were placed in the API separator. Approximately 3 feet of oily liquid and sludge were observed in each of the three compartments of the API separator (Ref. 7, p. 3). The sludge present in the API separator is considered to be a listed hazardous waste (K051), as codified in 40 CFR 261, Subpart D (Ref. 6, p. 4). The ground surrounding the API separator is covered with a black tar-like substance (Ref. 7, p. 3).

Several spills of waste oils and gasoline have occurred at the site. According to file information, the majority of the material spilled was recovered during clean-up activities (Ref. 19, pp. 1-3; Ref. 20, pp. 1-2). However, analytical results from soil and ground water samples collected during a Remedial Investigation conducted as a results of one of these spills in April 1990 indicated light to medium range hydrocarbons present in the onsite soils and in the shallow ground water encountered beneath the site (Ref. 8, pp. 6-7).

The site is currently inactive and abandoned. Wastes of concern that remain onsite include the sludges and oily materials present in the ASTs, the API separator, the earthen sump, and contaminated soils. In addition, between 30 and 40 55-gallon drums remain onsite (Ref. 4, pp. 25-26).

Potential Sources Not Evaluated

Another possible source of local ground water contamination is East Kelly of Kelly Air Force Base (AFB), which was home to a former jet engine repair facility. A ground water plume has been identified in the shallow ground water beneath East Kelly AFB and Kelly AFB is located approximately 800 feet west of the site (Ref. 23, pp. 1, 3). However, the ground water plume identified at East Kelly is considered to be a separate plume from the one identified beneath the site because contaminants associated with the East Kelly plume are chlorinated solvents while the contaminants associated with the R&H site are non-chlorinated petroleum hydrocarbons. Further, based on the local direction of ground water flow within the shallow alluvial aquifer, East Kelly AFB would be considered up-gradient of the R&H site and the presence of chlorinated solvents in wells located at the R&H site would be expected (Ref. 8, pp. 5, 15).

Because the presence of chlorinated solvents was not detected in any of the on-site wells, Kelly AFB is not considered to be a potential source of the contamination at the R&H site. In addition, Kelly AFB and the United States Air Force have been implementing corrective actions to capture the impacted ground water at East Kelly AFB. A brief summary of Kelly AFB and the corrective actions are presented in the following paragraphs.

Remedial investigations at Zone 4 of Kelly AFB, which began in 1993, were conducted under CERCLA guidance with the State of Texas Regulations as Applicable or Relevant and Appropriate Requirements (ARARs). Based on the results of an October 1993 soil gas survey, a series of soil borings and monitoring wells were installed in early 1994. Between 1994 and 1997, two additional phases of drilling and well installation occurred off-base to define the nature and extent of contaminated ground water emanating from Kelly AFB (Ref. 39, p. 9).

Several organic and inorganic contaminants have been detected, but four chlorinated organic compounds are predominant and include: 1,2-dichloroethene, trichloroethene, tetrachloroethene, and vinyl chloride. Concentrations are highest in the northwestern corner and in the southwestern corner of East Kelly AFB (Ref. 39, p. 13).

Eight horizontal wells have been installed along the southern and eastern boundaries of East Kelly AFB (Ref. 39, p. 10). Based on preliminary data, the horizontal wells appear to capture the ground water within the shallow alluvial aquifer and prevent it from migrating off-base. Documentation to substantiate these corrective actions is currently in the process of being produced.

Other potential sources located near the site include two automobile salvage yards and a truck repair business (Ref. 7, p. 2). While these particular businesses often generate wastes containing the same hazardous substances present in the contaminated ground water underlying the R&H Oil Company site, sufficient information to characterize these businesses as sources is lacking. Further, the majority of the ground water plume has been identified directly beneath the R&H Oil Company site. Therefore, the salvage yards and the truck repair business have been identified as potential sources but not evaluated further.

In addition, areas of hydrocarbon-stained soils have been observed in the northeastern portion of the site in the area of the four horizontal ASTs and within the containment area for AST 301. However, information regarding the products used or processes performed within these areas is not available to classify or evaluate these contaminated soils as legitimate sources.

The four horizontal ASTs were formerly used in the crude oil refining process and consist of ASTs 103 through 106 (Ref. 22, p. 66). There is no available information indicating the use of ASTs 103 and 104. Both ASTs currently contain an estimated total of 180 gallons of an oily, black liquid (Ref. 3, pp. 197-198). ASTs 105 and 106 were used to store volatile organics that had been separated and then condensed from used oils (Ref. 10, p. 1). Currently, both AST 105 and AST 106 contain an oily, black liquid (Ref. 3, pp. 199-200).

Previous TNRCC inspections have revealed the presence of a tar-like substance and hydrocarbon-saturated soils within the containment area for AST 301. AST 301 is located in the northwestern portion of the site. The containment area for AST 301 is the location of a single AST that has an estimated capacity of 227,000 gallons but the contents and use of AST 301 are unknown (Ref. 22, p. 72).

Four soil samples were collected from the site on 9 July 1998 during the Removal Assessment. The four soil samples, collected from 0 to 3 inches below ground surface, included the following: RHS0-08, RHS0-09, RHS0-16, and RHS0-21 (Ref. 3, pp. 19-20, 182). Soil samples RHS0-08, RHS0-09, and RHS0-21 were collected from the area of stained soils located beneath some of the piping configurations near the four horizontal ASTs (Ref. 22, p. 66). Hazardous substances detected in these four soil samples are summarized in the following table.

SUBSTANCE	SAMPLE ID	CONCENTRATION (DL or SQL)	REFERENCES
Benzene	RHS0-21	681 ug/kg (10.64)	Ref. 3, pp. 20, 182 ; Ref. 25, p. 2; Ref. 27, pp. 115-120
Fluoranthene	RHS0-16	14,100 ug/kg (351.06)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 85-90
Pyrene	RHS0-16	14,100 ug/kg (351.06)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 85-90
Arsenic	RHS0-08	41.5 mg/kg (2.13)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 43-50
Cobalt	RHS0-08	406 mg/kg (10.64)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 43-50
Copper	RHS0-08	26 mg/kg (5.32)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 43-50, 57-60
	RHS0-09	28.7 mg/kg (5.32)	
Mercury	RHS0-16	0.26 mg/kg (0.11)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 85-90
Selenium	RHS0-08	1.95 mg/kg (1.06)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 43-50
Zinc	RHS0-08	517 mg/kg (4.26)	Ref. 3, pp. 20, 182; Ref. 25, p. 2; Ref. 27, pp. 43-50, 57-60
	RHS0-09	351 mg/kg (4.25)	

Notes:

ug/kg micrograms per kilogram.
mg/kg milligrams per kilogram.
SQL Sample quantitation limit.
DL Detection limit.

Additionally, two composite soil samples were collected from the smaller tank battery located in the southern portion of the site on 9 July 1998. One sample, TPS0-01E, was collected from the eastern portion of the tank battery. One sample, TPS0-02W, was collected from the western portion of the tank battery (Ref. 4, pp. 15-16). QA/QC summary forms and result summaries are included as Reference 26. SQL calculations are provided as Reference 25.

SUBSTANCE	SAMPLE ID	CONCENTRATION (SQL)	REFERENCES
Benzo(a)pyrene	TPS0-02W	401 ug/kg (366.60)	Ref. 25, p. 2; Ref. 26, pp. 25-30
Aluminum	TPS0-01E	11,500 mg/kg (43.01)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	8,030 mg/kg (44.44)	
Arsenic	TPS0-01E	4.06 mg/kg (2.15)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	2.9 mg/kg (2.22)	
Barium	TPS0-01E	78.6 mg/kg (43.01)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	141 mg/kg (44.44)	
Chromium	TPS0-01E	7.49 mg/kg (2.15)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	10.9 mg/kg (2.22)	
Iron	TPS0-01E	6,260 mg/kg (21.51)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	10,200 mg/kg (22.22)	
Lead	TPS0-01E	8.35 mg/kg (1.07)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	14.4 mg/kg (1.11)	
Magnesium	TPS0-01E	2,550 mg/kg (1,075.27)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	3,720 mg/kg (1,111.11)	
Manganese	TPS0-01E	154 mg/kg (3.23)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	169 mg/kg (3.33)	
Vanadium	TPS0-02W	14.9 mg/kg (11.11)	Ref. 25, p. 2; Ref. 26, pp. 25-30
Zinc	TPS0-01E	19.9 mg/kg (4.30)	Ref. 25, p. 2; Ref. 26, pp. 19-30
	TPS0-02W	46.6 mg/kg (4.44)	

Notes:

ug/kg micrograms per kilogram.
mg/kg milligrams per kilogram.
SQL Sample quantitation limit.

3.1.2 Potential to Release

Aquifer Being Evaluated: Edwards Aquifer

Potential to release will be evaluated for the Edwards aquifer since it is a karst aquifer and due to the nature of karst, is considered extremely vulnerable to contamination. Additionally, the Edwards aquifer is considered the sole source of water for the domestic, agricultural, industrial, and recreational needs of the City of San Antonio and provides drinking water to over one million users (Ref. 32, p. 1).

3.1.2.1 Containment

Containment values for the ground water migration pathway for the seven sources identified for the R&H Oil Company site were assigned as follows:

SOURCE	DESCRIPTOR	CONTAINMENT VALUE	REFERENCE
1	No bottom liner present.	10	Ref. 1, Table 3-2
2	No bottom liner present.	10	Ref. 1, Table 3-2
3	No bottom liner present.	10	Ref. 1, Table 3-2
4	No bottom liner present.	10	Ref. 1, Table 3-2
5	No bottom liner present.	10	Ref. 1, Table 3-2
6	No bottom liner present.	10	Ref. 1, Table 3-2
7	No bottom liner present.	10	Ref. 1, Table 3-2

Containment Factor Value: 10

3.1.2.2 Net Precipitation

The City of San Antonio lies in south-central Texas. Based on Figure 3-2 from the HRS Final Rule, the site will be assigned a net precipitation factor value of 1 (Ref. 1, Figure 3-2).

Net Precipitation Factor Value: 1

3.1.2.3 Depth to Aquifer

The depth to aquifer is evaluated by determining the depth from the lowest known point of hazardous substances at a site to the top of the aquifer being evaluated. The depth of the lowest known point of hazardous substances recorded at the site is approximately 31 feet below ground surface. This depth is based on a monitoring well, MW-200, installed on-site in January 1991 (Ref. 8, pp. 13, 18). Manganese was detected in a ground water sample collected from monitoring well MW-200 (Ref. 36, pp. 37-42).

The depth to the top of the Edwards aquifer, based on a registered well log completed for a BMWD municipal supply well located within a 1-mile radius of the site, is approximately 1,090 feet below ground surface (Ref. 49, p. 3). Thus, the depth to aquifer would be determined from the lowest known point of hazardous substances (31 feet below ground surface) to the top of the aquifer being evaluated (1,090 feet below ground surface) and was determined to be 1,059 feet. Thus, based on a thickness of greater than 250 feet, a Depth to Aquifer factor value of 1 will be assigned from the HRS Table 3-5 (Ref. 1, Sec. 3.1.2.3).

Depth to Aquifer Factor Value: 1

3.1.2.4 Travel Time

The layers between the lowest known point of hazardous substances at the site (31 feet at MW-200) to the top of the Edwards aquifer consist of unconsolidated alluvium, shale, a carbonate chalk and mudstone, two massive limestone formations, and a calcareous clay. The unconsolidated alluvium consists of clay, silt, gravel, and caliche (Ref. 8, p. 5; Ref. 36, pp. 37-42; Ref. 40, p. 3). The geologic layers and associated thicknesses beneath the site are outlined in the table below.

LAYER	COMPOSITION	THICKNESS (feet)	CONDUCTIVITY (cm/sec)	REFERENCE
Alluvium	Sand, clay, and gravel	NE	10^{-2}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Midway Group	yellow clay	51	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sand	31	10^{-4}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Navarro Group	yellow clay, sand	38	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sandy shale	90	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sand	120	10^{-4}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sandy shale	104	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sand	15	10^{-4}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Taylor Group	rock	3	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	brown shale	102	10^{-8}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
	sandy shale	26	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Anacacho Limestone	argillaceous limestone and marl	120	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Brown Shale	brown shale	38	10^{-8}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Austin Chalk	argillaceous limestone	146	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Eagleford Shale	sandy shale	30	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Buda Limestone	fine grained, dense, hard, limestone	61	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Del Rio Shale	clay	53	10^{-8}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Georgetown Member	limestone	22	10^{-6}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4
Edwards Limestone	fractured limestone	410	10^{-4}	Ref. 1, Table 3-6; Ref. 49, pp. 2-4

NE The alluvium extends to a depth of 40 feet below ground surface. Therefore, 40 feet - 31 feet (lowest known point of hazardous substances) = 9 feet. According to the HRS Final Rule, portions of layers within the first 10 feet of the depth to aquifer are not evaluated (Ref. 1, Sec. 3.1.2.4).

A value from the HRS Final Rule, Table 3-7, is assigned as the travel time factor value based on the thickness and hydraulic conductivity of the lowest hydraulic conductivity layer(s) (Ref. 1, Sec. 3.1.2.4).

The layer(s) with the lowest hydraulic conductivity are the shales of the Taylor Group and the Brown Shale and the clay of the Del Rio Shale Group (Ref. 48, pp. 2-4). The hydraulic conductivity value for clay and shale is 10^{-8} (Ref. 1, Table 3-6). The total thickness for these layers is 193 feet (Ref. 48, pp. 2-4):

Taylor Group	102 ft
Brown Shale	38 ft.
Del Rio Shale	+ 53 ft.
	193 ft.

Based on the lowest hydraulic conductivity of 10^{-8} and an approximate thickness of between 100 feet and 500 feet, a travel time factor value of 1 was assigned from the HRS Table 3-7.

Lowest Hydraulic Conductivity: 10^{-8}
Travel Time Factor Value: 1

3.2 WASTE CHARACTERISTICS

The waste characteristics factor category value for an aquifer is based on two factors: toxicity/mobility and hazardous waste quantity. Only those hazardous substances that are available to the ground water migration pathway can be considered (Ref. 1, Sec. 3.2). Hazardous substances available to the ground water pathway have been presented previously in the source characterization section of this documentation record. A discussion of each separate factor value is presented in the following subsections. Factor values for toxicity and mobility are presented in the following table as well as calculations for the combined toxicity/mobility.

TOXICITY/MOBILITY FACTOR VALUES

HAZARDOUS SUBSTANCE	TOXICITY FACTOR VALUE ¹	MOBILITY FACTOR VALUE ²	TOXICITY/MOBILITY	REFERENCES
Benzene	100	1	100	Ref. 1; Ref. 2
Benzo(a)anthracene	1000	1	1000	Ref. 1; Ref. 2

Benzo(b)fluoranthene	10000	1	10000	Ref. 1; Ref. 2
Carbon Disulfide	1000	1	1000	Ref. 1; Ref. 2
Chrysene	10	1	10	Ref. 1; Ref. 2
Ethylbenzene	10	1	10	Ref. 1; Ref. 2
Fluoranthene	100	1	100	Ref. 1; Ref. 2
2-Methylnaphthalene	---	1	---	Ref. 1; Ref. 2
Naphthalene	100	1	100	Ref. 1; Ref. 2
Pyrene	100	1	100	Ref. 1; Ref. 2
Tetrachloroethene	100	1	100	Ref. 1; Ref. 2
1,1,1-Trichloroethene	1	1	1	Ref. 1; Ref. 2
Trichlorofluoromethane	10	1	10	Ref. 1; Ref. 2
Toluene	10	1	10	Ref. 1; Ref. 2

Notes:

- 1 Value assigned using the Superfund Chemical Data Matrix (Ref. 2).
- 2 A mobility factor value of 1 is assigned for a karst aquifer and because the substance meets the criteria for an observed release to ground water (Ref. 1, Sec. 3.2.1.2).

TOXICITY/MOBILITY FACTOR VALUES (Continued)

HAZARDOUS SUBSTANCE	TOXICITY FACTOR VALUE ¹	MOBILITY FACTOR VALUE ²	TOXICITY/MOBILITY	REFERENCES
Aluminum	---	1	---	Ref. 1; Ref. 2
Antimony	10,000	1	10,000	Ref. 1; Ref. 2
Arsenic	10,000	1	10,000	Ref. 1; Ref. 2
Barium	10	1	10	Ref. 1; Ref. 2
Cadmium	10,000	1	10,000	Ref. 1; Ref. 2
Chromium	10,000	1	10,000	Ref. 1; Ref. 2
Cobalt	1	1	1	Ref. 1; Ref. 2
Copper	---	1	---	Ref. 1; Ref. 2
Iron	1	1	1	Ref. 1; Ref. 2
Lead	10,000	1	10,000	Ref. 1; Ref. 2
Magnesium	---	1	---	Ref. 1; Ref. 2
Manganese	10,000	1	10,000	Ref. 1; Ref. 2
Nickel	10,000	1	10,000	Ref. 1; Ref. 2
Selenium	100	1	100	Ref. 1; Ref. 2
Zinc	10	1	10	Ref. 1; Ref. 2
Cyanide	100	1	100	Ref. 1; Ref. 2

Notes:

1 Value assigned using the Superfund Chemical Data Matrix (Ref. 2).

2 A mobility factor value of 1 is assigned for a karst aquifer and because the substance meets the criteria for an observed release to ground water (Ref. 1, Sec. 3.2.1.2).

3.2.1 Toxicity/Mobility**3.2.1.1. Toxicity**

According to the HRS Rule, toxicity is evaluated for those hazardous substances at the site that are available to a pathway being scored (Ref. 1, Sec. 2.4.1.1). Toxicity values for hazardous substances are assigned in the Superfund Chemical Data Matrix (SCDM) and presented in a table beginning on page 85 of this documentation record (Ref. 2).

3.2.1.2 Mobility

According to the HRS Rule, for any hazardous substance that meets the criteria for an observed release by

chemical analysis to one or more aquifers underlying the source(s) at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1 (Ref. 1, Sec. 3.2.1.2). Mobility values for hazardous substances are assigned in the SCDM and presented in a table beginning on page 85 of this documentation record (Ref. 2).

3.2.2 Hazardous Waste Quantity

Since a hazardous waste quantity could not be adequately determined for all sources identified at the R&H site and none of the targets for the ground water pathway are subject to Level I or Level II concentrations, a value from HRS Table 2-6 or a value of 10, which is greater, is assigned as the hazardous waste quantity factor value for that pathway (Ref. 1, Sec. 2.4.2.2). As such, a pathway hazardous waste quantity factor value of 10 is assigned.

Pathway Hazardous Waste Quantity Factor Value: 10

Source	Source Hazardous Waste Quantity Value	Is source hazardous constituent quantity data complete?
1	80	No
2	0.948	No
3	1.42	No
4	0.218	No
5	3.36	No
6	23.077	No
Sum of Values	109.023	

The sum of the Source Hazardous Waste Quantity Values is assigned as the Hazardous Waste Quantity Factor Value (Ref. 1, Sec. 2.4.2.2). The sum of the source hazardous waste quantity values for 109.023 rounded to the nearest integer, is 109. A Hazardous Waste Quantity Factor Value of 100 is assigned from Ref. 1, Table 2-6, to a site whose sum of source hazardous waste quantity values is greater than 100 and less than 10,000 (Ref. 1, Table 2-6).

3.2.3 Waste Characteristics Factor Category Value

According to the HRS Rule, the waste characteristics factor category value is derived by multiplying the toxicity/mobility factor value by the hazardous waste quantity factor value (Ref. 1, Sec. 3.2.3). Based on this, a value from Table 2-7 of the HRS Rule is assigned to the waste characteristics factor category (Ref. 1, Sec. 3.2.3).

The toxicity/mobility factor of 10,000 combined with the hazardous waste quantity factor of 100 equals a product of 1,000,000. According to Table 2-7 of the HRS Rule, a product of 1,000,000 equates to a waste characteristics factor category value of 32 (Ref. 1, Table 2-7).

Waste Characteristics Factor Value: 32

3.3 TARGETS

The Edwards aquifer is one of the most permeable and productive carbonate aquifers in the United States (Ref. 28, p. 5). San Antonio, which obtains its entire municipal supply from the Edwards aquifer, is one of the largest cities in the world to rely solely on a single ground water source (Ref. 43, p. 1).

The Edwards aquifer supplies water to the irrigation, military, and industrial establishments of practically all the area (Ref. 31, p. 8). Thousands of wells tap the Edwards aquifer. The greatest density of wells is in Uvalde and Bexar counties (Ref. 28, p. 14). Approximately 54 percent of the total water pumped from the Edwards aquifer by the City of San Antonio is used for municipal supply (Ref. 43, p. 1).

Target wells consist of municipal supply wells located within the Target Distance Limit (TDL) of a 4-mile radius of the R&H Oil Company site. As the Edwards aquifer is the sole source water supply for the City of San Antonio, all of the BMWD municipal wells are completed within the Edwards aquifer. Information on target wells identified within a 4-mile radius of the site was obtained from the BMWD database and has been presented in the table below. Screened intervals of the target wells are comparable to those of the BMWD municipal wells sampled in July 1998 (refer to pages 85 and 86 of this documentation record). Well locations within each distance radii are depicted on Figure A-9 of Attachment A (Ref. 22, p. 102). The distance radii from the site were measured from the approximate center of the site.

TARGET WELLS

WELL ID	DISTANCE CATEGORY (miles)	LEVEL I (Y/N)	LEVEL II (Y/N)	POTENTIAL (Y/N)	REFERENCES
0150249L Southside Station # 5 - Well 4 Screen: 1253' - 1637'	¼ - ½	No	No	Yes	Ref. 22, pp. 110, 119
0150249M Southside Station # 5 - Well 5 Screen: 1237' - 1449'	¼ - ½	No	No	Yes	Ref. 22, pp. 110, 119, 125
0140249K Southside Station # 5 - Well 3 Screen: 1229' - 1644'	¼ - ½	No	No	Yes	Ref. 22, pp. 110, 119, 125; Ref. 40, pp. 7-8
0150249I Southside Station # 5 - Well 1 Screen: 1088' - 1423'	¼ - ½	No	No	Yes	Ref. 22, pp. 111, 119, 125

TARGET WELLS (Continued)

WELL ID	DISTANCE CATEGORY (miles)	LEVEL I (Y/N)	LEVEL II (Y/N)	POTENTIAL (Y/N)	REFERENCES
0150249F Southside Station # 3 - Well 4 Screen: 1279' - 1434'	½ - 1	No	No	Yes	Ref. 22, pp. 111, 119-120
0150249E Southside Station # 3 - Well 3 Screen: 1263' - 1326'	½ - 1	No	No	Yes	Ref. 22, pp. 111, 119
0150249G Southside Station # 3 - Well 5 Screen: 1251' - 1586'	½ - 1	No	No	Yes	Ref. 22, pp. 111, 119-120
0150249P Southside Station # 6 - Well 3 Screen: 1206' - 1530'	1 - 2	No	No	Yes	Ref. 22, pp. 112, 119, 126
0150249O Southside Station # 6 - Well 2 Screen: 1218' - 1420'	1 - 2	No	No	Yes	Ref. 22, pp. 112, 119, 126
0150249Q Southside Station # 6 - Well 4 Screen: 1217' - 1517'	1 - 2	No	No	Yes	Ref. 22, pp. 112, 119, 126
0150249D Southside Station # 2 - Well 2 Screen: 920' - 1388'	1 - 2	No	No	Yes	Ref. 22, pp. 112, 119, 123
0150249C Southside Station # 2 - Well 1 Screen: 1207' - 1400'	1 - 2	No	No	Yes	Ref. 22, pp. 113, 119
0150249H Southside Station # 4 - Well 1 Screen: 982' - 1479'	1 - 2	No	No	Yes	Ref. 22, pp. 113, 119
0150249A Southside Station # 1 - Well 1 Screen: 1226' - 1666'	1 - 2	No	No	Yes	Ref. 22, pp. 113, 119
0150249B Southside Station # 1 - Well 2 Screen: 1230' - 1708'	1 - 2	No	No	Yes	Ref. 22, pp. 113, 119
0150113E Kelly AFB - Bldg. 3010 Screen: unknown	1 - 2	No	No	Yes	Ref. 22, pp. 113, 119, 123; Ref. 40, pp. 17-18
0150113G Kelly AFB - Bldg. 81 Screen: 1100' - 1500'	1 - 2	No	No	Yes	Ref. 22, pp. 114, 119, 123

TARGET WELLS (Continued)

WELL ID	DISTANCE CATEGORY (miles)	LEVEL I (Y/N)	LEVEL II (Y/N)	POTENTIAL (Y/N)	REFERENCES
0150113I Kelly AFB - Bldg. 2047 Screen: unknown	2 - 3	No	No	Yes	Ref. 22, pp. 114, 119, 123
0150113D Kelly AFB - Bldg. 1638 Screen: unknown	2 - 3	No	No	Yes	Ref. 22, pp. 114, 119, 123
0150113F Kelly AFB - Bldg. 1536 Screen: 968' - 1042'	2 - 3	No	No	Yes	Ref. 22, pp. 114, 119, 123
0150018M SAWS Mission # 1 Screen: 1275' - 1582'	2 - 3	No	No	Yes	Ref. 22, pp. 114, 119, 122
0150018N SAWS Mission # 5 Screen: 1333' - 1800'	2 - 3	No	No	Yes	Ref. 22, pp. 114, 119, 122
0150018O SAWS Mission # 6 Screen: 1326' - 1521'	2 - 3	No	No	Yes	Ref. 22, pp. 115, 119, 122
0150018P SAWS Mission # 2 Screen: unknown	2 - 3	No	No	Yes	Ref. 22, pp. 115, 119, 122
01500018Q SAWS Mission # 3 Screen: unknown	2 - 3	No	No	Yes	Ref. 22, pp. 115, 119, 122
0150018S SAWS Mission # 7 Screen: 1320' - 1550'	2 - 3	No	No	Yes	Ref. 22, pp. 115, 119, 122
0150019R SAWS Mission # 4 Screen: 1347' - 1510'	2 - 3	No	No	Yes	Ref. 22, p. 116, 119, 122
0150131A Trailer City Water Co. - Well 1 Screen: 1130' - 1552'	2 - 3	No	No	Yes	Ref. 22, p. 116
0150186A Lazy Acres MHP Total Depth: 1429'	3 - 4	No	No	Yes	Ref. 22, p. 116
0150187B Brookdale MHP Screen: unknown	3 - 4	No	No	Yes	Ref. 22, p. 116

TARGET WELLS (Continued)

WELL ID	DISTANCE CATEGORY (miles)	LEVEL I (Y/N)	LEVEL II (Y/N)	POTENTIAL (Y/N)	REFERENCES
0150485A San Antonio Packing Co. Total Depth: 998'	3 - 4	No	No	Yes	Ref. 22, pp. 116, 121
0150381A Surlean Meat Co. - Well 1 Total Depth: 762'	3 - 4	No	No	Yes	Ref. 22, pp. 116, 121
0140113H Kelly AFB - Bldg. 1040G Total Depth: 1590'	3 - 4	No	No	Yes	Ref. 22, p. 117
0150191A Our Lady of the Lake Univ. Total Depth: 1380'	3 - 4	No	No	Yes	Ref. 22, p. 117
0150290A Vail's MHP Total Depth: 1450'	3 - 4	No	No	Yes	Ref. 22, p. 117
0150425C L&H Packing Co. Total Depth: 1475'	3 - 4	No	No	Yes	Ref. 22, pp. 117, 119, 122
0150018BG SAWS Gateway # 1 Total Depth: 1387'	3 - 4	No	No	Yes	Ref. 22, p. 117
0150018BH SAWS Gateway # 2 Total Depth: 1570'	3 - 4	No	No	Yes	Ref. 22, p. 118

3.3.1 Nearest Well

According to the HRS Rule, if none of the drinking water wells is subject to Level I or Level II concentrations and one of the target aquifers is a karst aquifer that underlies any portion of the sources at the site and any wells draw drinking water from this karst aquifer within the target distance limit, a nearest well factor value of 20 is assigned. As such, the City of San Antonio BMWD public supply wells are completed within the Edwards aquifer which is considered a karst aquifer (Ref. 7, p. 4). There are approximately 38 public supply and/or private drinking water wells located within a 4-mile radius of the site (Ref. 22, pp. 111-126). As such, a value of 20 has been assigned as the Nearest Well Factor Value.

Nearest Well Factor Value: 20

3.3.2 Population

A discussion of the population served by drinking water wells (i.e., public supply wells) within a 4-mile radius Target Distance Limit is presented in the following subsections.

3.3.2.1. Level of Contamination

3.3.2.2 Level I Concentrations

Level I concentrations are established in samples from drinking water wells in which the concentration of a hazardous substance that meets the criteria for an observed release is at or above its drinking water benchmark (Ref. 1, Sec. 2.5). Drinking water benchmarks, as set forth in SCDM, include Maximum Contaminant Levels (MCLs) and/or screening concentrations for cancer risk (Ref. 2).

Level I concentrations have not been documented in any well (public supply or private) completed within the shallow alluvial aquifer or the Edwards aquifer. Therefore, a Level I Concentration Factor Value of 0 will be assigned (Ref. 1, Sec. 3.3.2.2).

Level I Concentration Factor Value: 0

3.3.2.3 Level II Concentrations

Level II concentrations are established in samples from drinking water wells in which the concentration of a hazardous substance meets the criteria for an observed release, but is less than its drinking water benchmark (Ref. 1, Sec. 2.5). Drinking water benchmarks, as set forth in SCDM, include MCLs and/or screening concentrations for cancer risk (Ref. 2).

Level II concentrations have not been documented in any well (public supply or private) completed within the shallow alluvial aquifer or the Edwards aquifer. Therefore, a Level II Concentration Factor Value of 0 will be assigned (Ref. 1, Sec. 3.3.2.2).

Level II Concentration Factor Value: 0

3.3.2.4 Potential Contamination

Potential contamination will be evaluated based on the potential for nearby private and municipal supply wells to be exposed to site-related contamination. The TNRCC performed a thorough water well search for the June 2000 SSI report in which the number of connections and users for the BMWD public water supply was identified. Because the water well search and apportionment of the population has already been completed

by the TNRCC, their data will be reproduced here (Ref. 22, pp. 129-131).

The City of San Antonio has a blended distribution system with no one public supply well contributing more than 40 percent of the total water supplied to the system (Ref. 22, pp. 111-131). Based on a map of the public supply well locations, there are 38 public supply and/or private drinking water wells located within a 4-mile radius of the site (Ref. 22, pp. 111-131).

The Edwards aquifer is one of the most permeable and productive carbonate aquifers in the United States (Ref. 28, p. 5). It has been designated as a sole source water supply for the City of San Antonio and supplies water to the irrigation, military, and industrial establishments of practically all the area (Ref. 31, p. 8). The Edwards aquifer supplies most of the water for municipal, industrial, irrigation, and domestic purposes. More than 70 percent of the water withdrawn for municipal supply is used by the City of San Antonio (Ref. 31, pp. 13, 16).

Ground water moving through the aquifer has dissolved large amounts of rock to create highly permeable solution zones and channels that facilitate rapid flow and relatively high storage capacity within the aquifer. Highly fractured strata have also preferentially dissolved to form conduits capable of transmitting large amounts of water. Due to its extensive honeycombed and cavernous character, the aquifer yields moderate to large quantities of water (Ref. 43, p. 1).

The BMWD provided population and connection data based on different types of service levels for a system (i.e., sub-system). Thus, since no one well of each sub-system contributed more than 40 percent of the total water supplied, the total number of individuals served by each sub-system was divided by the total number of wells serving that sub-system in order to apportion the number of individuals served by each well (Ref. 1, Sec. 3.3.2; Ref. 22, pp. 111-131).

The distance-weighted population values based on these calculations for those BMWD public supply wells located within a 4-mile radius of the site are presented in the following table. All ground water wells considered subject to potential contamination as well as the specific distance radii are depicted on Figure A-9 of Attachment A.

WELLS SUBJECT TO POTENTIAL CONTAMINATION

WELL ID	WELL GPM	% TOTAL GPM	APPORTIONED POPULATION PER WELL	REFERENCES
Distance radius: ¼ to ½ mile				
Southside Station # 5 - Well 4	4800	11.7	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 5 - Well 5	7000	17.1	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 5 - Well 3	2000	4.9	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 5 - Well 1	1200	2.9	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Total Population Served: 23,595.2				
Distance radius: ½ to 1 mile				
Southside Station # 3 - Well 4	2000	4.9	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 3 - Well 3	2000	4.9	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 3 - Well 5	4000	9.7	5898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Total Population Served: 17,696.4				
Distance radius: 1 to 2 miles				
Southside Station # 6 - Well 3	1510	3.7	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 6 - Well 2	1835	4.5	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 6 - Well 4	7480	18.2	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 2 - Well 2	1800	4.4	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 2 - Well 1	370	0.9	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 4 - Well 1	1500	3.7	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 1 - Well 1	1635	4	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Southside Station # 1 - Well 2	1900	4.6	5,898.8	Ref. 22, p. 129; Ref. 40, pp. 71-78
Kelly AFB - Bldg. 3010	1120	16	3583.3	Ref. 22, p. 129; Ref. 40, pp. 17-18
Kelly AFB - Bldg. 81	1300	18.5	3583.3	Ref. 22, p. 129; Ref. 40, pp. 17-18
Total Population Served: 54,357				

WELLS SUBJECT TO POTENTIAL CONTAMINATION (Continued)

WELL ID	WELL GPM	% TOTAL GPM	APPORTIONED POPULATION PER WELL	REFERENCES
Distance radius: 2 to 3 miles				
Kelly AFB - Bldg. 2047	1100	15.7	3583.3	Ref. 22, p. 130
Kelly AFB - Bldg. 1638	1500	21.4	3583.3	Ref. 22, p. 130; Ref. 40, p. 15
Kelly AFB - Bldg. 1536	700	10	3583.3	Ref. 22, p. 130
SAWS Mission # 1	8194	7.9	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 5	8472	8.2	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 6	8472	8.2	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 2	5903	5.7	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 3	5972	5.8	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 7	1	0	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
SAWS Mission # 4	8194	7.9	16,926.6	Ref. 22, p. 130; Ref. 40, pp. 24-27; Ref. 50, pp. 25, 31
Trailer City Water Co. - Well 1	unknown	unknown	192	Ref. 22, p. 130; Ref. 40, pp. 24-27
Total Population Served: 129,407.1				
Distance radius: 3 to 4 miles				
Lazy Acres MHP	unknown	unknown	102	Ref. 22, p. 130; Ref. 40, p. 85
Brookdale MHP	unknown	unknown	62	Ref. 22, p. 130; Ref. 40, pp. 86-87
San Antonio Packaging Co.	unknown	unknown	25	Ref. 22, p. 130; Ref. 40, p. 89
Surlean Meat Co. - Well 1	unknown	unknown	220	Ref. 22, p. 130; Ref. 40, pp. 81-82
Kelly AFB - Bldg. 1040G	unknown	unknown	3,583.3	Ref. 22, p. 130
Our Lady of the Lake University	unknown	unknown	1,000	Ref. 22, p. 130; Ref. 40, pp. 79-81
Vail's MHP	unknown	unknown	87	Ref. 22, p. 130; Ref. 40, p. 88
L&H Packing Co.	unknown	unknown	250	Ref. 22, p. 131; Ref. 40, p. 83
SAWS Gateway # 1	unknown	unknown	11608	Ref. 22, p. 131
SAWS Gateway # 2	unknown	unknown	11,608	Ref. 22, p. 131
Total Population Served: 28,545.3				

For each calculated population within a specific distance category, a distance weighted population value is assigned from the HRS Table 3-12 for the "karst" aquifer category. The sum of the distance weighted population values is then divided by 10 and rounded to the nearest integer to determine the Potential Contamination Factor Value (Ref. 1, Sec. 3.3.2.4). As such, the distance weighted population value calculations for public supply and private drinking water wells subject to potential contamination are presented in the following table.

DISTANCE-WEIGHTED POPULATION VALUE

DISTANCE CATEGORY (miles)	APPORTIONED POPULATION	DISTANCE-WEIGHTED POPULATION VALUE	REFERENCES
0 to ¼	0	0	Ref. 1, Table 3-12
¼ to ½	23,595.2	10,122	Ref. 1, Table 3-12
½ to 1	17,696.4	8,163	Ref. 1, Table 3-12
1 to 2	48,458.2	26,068	Ref. 1, Table 3-12
2 to 3	129,407.1	81,623	Ref. 1, Table 3-12
3 to 4	28,545.3	8,163	Ref. 1, Table 3-12
TOTAL		134,139	Ref. 1, Table 3-12

Sum of Distance Weighted Population Values: 134,139/10
Potential Contamination Factor Value: 13,413.9

3.3.3 Resources

A review of registered well logs for the State of Texas, and located within a 4-mile radius of the site, indicated that water from the Edwards aquifer is also used for the following resources: irrigation of commercial food crops, commercial livestock watering, and commercial food preparation (Ref. 40, pp. 22, 81, 83).

According to the HRS Rule, if water drawn from any target well for the aquifer being evaluated is used for any purpose listed in HRS Section 3.3.3, a Resources Factor Value of 5 is assigned (Ref. 1, Sec. 3.3.3). Since water from the Edwards aquifer has been documented to be used for the aforementioned resources, a Resources Factor Value of 5 has been assigned.

Resources Factor Value: 5

3.3.4 Wellhead Protection Areas

A Wellhead Protection Area (WHPA) is defined as the area designated by states according to Section 1428 of the Safe Drinking Water Act (SDWA), as amended to protect wells and recharge areas that supply public drinking water systems (Ref. 30, p. 6).

One public supply well within a 4-mile radius of the site, well # 0150018, has been identified as having a designated WHPA (Ref. 41, p. 1). According to the HRS Rule, if a source with a ground water contamination factor value greater than 0 lies partially or fully within or above the designated WHPA, a value of 20 is assigned as the Wellhead Protection Area Factor Value (Ref. 1, Sec. 3.3.4). If this criterion is not applicable, then a value of 5 is assigned if there is a designated WHPA applicable to the aquifer being evaluated or overlying aquifers within the target distance limit.

Since one WHPA has been designated for a public supply well located within a 4-mile radius of the site, a value of 5 has been assigned as the Wellhead Protection Area Factor Value per HRS Rule Section 3.3.3.

Wellhead Protection Area Factor Value: 5

3.4 GROUND WATER MIGRATION SCORE FOR AN AQUIFER

The ground water migration score for the Edwards aquifer was calculated based on the Potential to Release and scored as follows:

$$\begin{aligned}\text{Score} &= \text{Likelihood of Release} \times \text{Waste Characteristics} \times \text{Targets}/82,500 \\ &= 30 \times 32 \times 13,444 / 82,500 \\ &= 156.44 \text{ (subject to a maximum of 100)}\end{aligned}$$

According to the HRS Rule, the ground water migration score for an aquifer is subject to a maximum value of 100 (Ref. 1, Sec. 3.4). As such, a value of 100 is assigned as the ground water migration score for an aquifer.

Ground Water Migration Score: 100

3.5 CALCULATION OF GROUND WATER MIGRATION PATHWAY SCORE

A value of 100 is assigned as the ground water migration pathway score for the site. As such, the ground water migration score for an aquifer will be assigned as the ground water migration pathway score (Ref. 1, Sec. 3.5).

Ground Water Migration Pathway Score: 100

4.0 SURFACE WATER MIGRATION PATHWAY SCORE - NOT EVALUATED

The surface water migration pathway will not be evaluated because it is not expected to contribute significantly to the site score. Further, the site score exceeds 28.5 based only on the evaluation of the ground water migration pathway.

5.0 SOIL EXPOSURE - NOT EVALUATED

Soil exposure will not be evaluated because it is not expected to contribute significantly to the site score. Further, the site score exceeds 28.5 based only on the evaluation of the ground water pathway.

6.0 AIR MIGRATION PATHWAY - NOT EVALUATED

The air migration pathway will not be evaluated because it is not expected to contribute significantly to the site score. Further, the site score exceeds 28.5 based only on the evaluation of the ground water migration pathway.

Figure A-1 - Facility Location Map

A copy of this figure is available at the EPA Headquarters Superfund Docket:

U.S. CERCLA Docket Office
Crystal Gateway #1, 1st Floor
1235 Jefferson Davis Highway
Arlington, VA 22202

Telephone: (703) 603-8917

E-Mail: superfund.docket@epa.gov

Figure A-2 - Site Plan

A copy of this figure is available at the EPA Headquarters Superfund Docket:

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Crystal Gateway #1, 1st Floor
1235 Jefferson Davis Highway
Arlington, VA 22202

Telephone: (703) 603-8917

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Figure A-3 - Historical Ownership - Monarch Refining Company
A copy of this figure is available at the EPA Headquarters Superfund Docket:

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Arlington, VA 22202

Telephone: (703) 603-8917
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Figure A-4 - Historical Ownership - Flint Chemical Corporation

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Arlington, VA 22202

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Figure A-5 - Soil Sample Location Map

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Figure A-6 - Well Location Map - Shallow Aquifer

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Figure A-7 - Estimated Extent of Groundwater Plume

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Figure A-8 - Well Location Map - Edwards Aquifer

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